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ABSTRACT

A study of the Women in Science Program, particularly the Career Facilitation Projects, was conducted through on-site visits to assess initial project functioning to determine whether alterations in the program guidelines should be recommended. Based on the individual on-site reports, findings and conclusions are presented, participants and projects are categorized. Participants are categorized as those who are currently not working and wish to return gradually or wish to return full-time, and those already working who wish to change jobs. Project emphases are categorized as updating previous academic backgrounds, providing new career direction, or a combination of both. Recommendations are made regarding the Women in Science Career Facilitation Projects. Individual on-site reports are provided from 11 colleges and universities: American University; University of California at Davis; Chestnut Hill College; University of Dayton; George Mason University; University of Lowell; University of Notre Dame; Polytechnic Institute of New York; College of St. Catherine; University of Texas-Austin; and Washington State University. (SPG)

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ON-SITE ASSESSMENT OF THE WOMEN IN SCIENCE CAREER FACILITATION PROGRAM

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FEBRUARY 1978

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NATIONAL SCIENCE FOUNDATION
Directorate for Science Education

On-site Assessment of the Women in Science Career Facilitation Program

by
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February 15, 1978

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Introduction and Summary

The Women in Science sub-program has existed within the Student-Oriented Programs of the Science Education Directorate since FY 1976. Prior to FY 1976, the Directorate has supported a small number of experimental projects intended to increase the participation of women in science careers, one of which - at Rosemont College - became the model for the Career Facilitation Projects now being supported. However, this is the first formal attempt by the Directorate to program for women.

The Program Manager for Women in Science, M. Joan Callanan, requested assistance from the Office of Program Integration in obtaining evaluation information regarding the Women in Science Program, and in particular the Career Facilitation Projects component, which represented a substantial proportion of the Women in Science funds awarded during FY 1976 and FY 1977. OPI recommended including the Career Facilitation projects in a program evaluation solicitation (SE 77-70) issued in June 1977, and conducting a study using internal staff and consultants. Both recommendations were accepted. The former study will address the need for the program, the number of eligible women, and alternative program structures that might be employed. This study is expected to begin by summer, 1978, and take approximately one year to complete. The study done by staff plus external consultants was intended, through on-site visits, to provide information on the functioning of the initial projects to determine whether alterations in the Program Guidelines should be recommended. The series of on-sites was to be a more rapid, informal and inexpensive assessment, recognizing that the projects could not reach any reasonable degree of maturity in the year or less that had passed since their initiation. This report summarizes the findings from the on-site study.

Based on the individual on-site reports, the following findings and conclusions are noted.

1. On the positive side.

The projects are very well-run indicating this will be a good test of the Career Facilitation Workshops concept. Most of the Project Directors are capable administrators and dynamic leaders.

Participants are extremely enthusiastic about the experience.

Faculty members are pleased with the performance of the project participants.

Early indications are that the participants have acquired useful knowledge and most will find jobs or enter graduate school at the conclusion of their project.

2. On the negative side.

Many projects failed to attract the number of participants desired, several markedly so.

Few of the projects funded in 1976 would continue without additional external support.

Most projects attempted to include too much material for the time available.

The approaches adopted are heavily academic, with limited job skill emphasis in most projects.

Evaluation procedures seldom yielded relevant, objective information regarding student performance.

3. Regarding Directorate organization, a concern was raised about treating the Career Facilitation Projects as a block program when the funds available argue this must be a research, development and dissemination effort.

4. Other comments and observations noted are:

Location of projects is critical if they are to obtain adequate numbers of participants.

The issue of participant support is likely to continue to be a problem.

Participants in projects of this duration cannot be expected to achieve the equivalent of a bachelors degree in a specific science area unless they already have a degree in that area.

It is unclear whether academic departments can or will respond to the job skill needs of participants.

There needs to be better information about the potential pool of women eligible for and interested in projects of this nature. These projects may have set unrealistically high entrance requirements on the assumption that there is a large number of academically well-prepared women who would wish to participate.

Although they have not been adequately recruited, one likely group of potential participants is pre-college science teachers.

Another group that is very much in evidence in the projects is foreign-born women, usually with degrees from foreign institutions.

The job readiness and career development components of projects may be a critical area for further investigation.

Although almost all participants appreciated the support of the group in the project, there is not enough evidence to judge whether projects need to be organized as self-contained entities.

As a means of highlighting differences in the projects and participants, a schema is developed. Participants are categorized as those who are currently not working and, (a) wish to return gradually, or (b) wish to return full-time, and (c) those already working who wish to change jobs. Project emphases are categorized as (a) updating previous academic backgrounds, (b) providing a new career direction, or (c) a combination of a & b. Implications are drawn from the cross-comparison of participants and project emphases.

Recommendations made regarding the Women in Science Career Facilitation Projects are grouped according to those relating to Program Guidelines and Proposal Review Procedures, Program Directions, and broader concerns for the Science Education Directorate.

For Program Guidelines and Proposal Review Guidelines require that:

Participants, activities and outcomes be clearly specified in proposals.

Proposals clearly identify local need and the presence of an adequate pool of potential applicants.

Publicity procedures be clearly related to the participants desired.

Evaluation procedures in proposals delineate how prerequisite skills and knowledge will be determined.

Institutionalization plans be carefully specified.

For program directions:

Experiment with cooperative university, government and industry project.

Explore whether sites other than universities might be more appropriate for projects of this nature.

Experiment with broader entrance requirements.

Encourage broader attempts at presenting and assessing the impact of job searching and career development learning activities.

For the Science Education Directorate:

Either move the Women in Science Program to the Science Education Research and Development Division or create research and development units within the SPI and SERI Divisions.

Adopt the model employed in this study for all new programs in the Directorate.

We wish to thank Charles Bertram, Lee Burks, Evelyn Brzezinski and Alma Lantz for their assistance in this study. Their insights have been most helpful, and their evaluation efforts of highest quality. And a special note of thanks to Joan Callanan for her sustained interest and assistance in all phases of this study. Discussions with her after each on-site helped as to crystallize our views about the projects as well as the nature of this study.

Overview

The Women in Science Program was initiated in FY 76 to develop and test methods to attract women to and retain them in science careers. Two components of this program were begun at that time - Science Career Workshops and Science Career Facilitation Projects. The Workshops are one- or two-day efforts intended to acquaint college women with a variety of careers in the sciences. The Facilitation Projects are aimed at women who already hold a degree in science who are currently either out of the scientific work force or are under-employed. A third component was added to the Women in Science program in 1977 called the Visiting Women Scientists Program. It will provide for recognized women scientists to make presentations to secondary school students and to serve as role models for those young women who might consider a science career.

This investigation deals only with the Career Facilitation Projects component of Women in Science. These projects are modeled on an experimental project at Rosemont College which was previously funded by NSF. The Rosemont project, which is still operating, represented a relatively short but intensive program of review and skill building; while problems were noted with this approach, it held the promise of having significant impact on the return of women to science careers. Given the belief that there are substantial numbers of women with earned degrees in the sciences who are not pursuing science as a career, there is

reason to pursue this as a prime area for intervention by the federal government.

The Career Facilitation Projects are targeted on those women who are from two or more years beyond their last science degree. As in the Rosemont project, no stipend is provided to the participants, but the project is to be offered without a tuition charge. No content specifications are mandated, and the length of the project can be up to two years with up to twelve months for the educational component. Eleven projects were funded in 1976 and another 10 were funded in 1977; approximately $700,000 was expended for these projects in each of these years. No opportunity was provided for renewal in either of these years.

There was considerable variation in content, size, duration, and intensity among the 11 projects funded in 1976, as detailed in the individual project descriptions. Despite this, there was a good deal of similarity in the approaches adopted by the projects. Each tended to treat the participants as a self-contained group for at least part of the project. The instruction consisted of review and new materials delivered through traditional lecture format, which was often supplemented with individualized materials and laboratory experiences. In addition, there was often a periodic seminar with content experts as speakers, and sessions to discuss common problems encountered in returning to school and techniques for finding jobs. While many of the participating women took additional coursework in addition to the project, they tended to identify themselves as part of the "WIS" group and had the majority of their interactions with that group.

The purpose of this study was to take an initial look at the progress of the Career Facilitation Projects with the intent to alter Program Guidelines and procedures if changes appeared desirable. It was recognized from the outset that there was limited opportunity to collect impact information as most of the 1976 projects were not completed, and the 1977 projects would have barely started. Therefore, the emphasis was primarily on the process of the activities, supplemented by what impact information could be gathered or surmised at the time of the study. Primarily we were looking for commonalities across the projects that seemed to lead to successful or unsuccessful operations in order to provide a basis to advise the future projects. We were also interested in collecting information about the individual projects that could be useful in the external program evaluation now being designed and in the preparation and review of proposals for projects submitted in FY 1978.

Significant changes have already occurred in the 1978 Guidelines for submission of proposals, some of which were influenced by preliminary information from this study. For example, in 1978, there will be provision for some participant support, as it was found that undue hardship was occurring in some cases when no funds could be used for this purpose. Also, the 1978 competition is open to 1976 grantees only, as it was felt that enough examples had been initiated in 1976 and 1977 while the most pressing questions had to do with continuation and institutional commitment, issues better explored in existing projects.

From the outset, limitations must be declared for this study. It is not and it was not intended to be a careful, experimental study. It is, to the contrary, a rapid and somewhat subjective look at what is occurring with these projects. Thus the findings are suggestive rather than conclusive. We saw this as an opportunity to draw early impressions of the program, and probably to encourage more concern for evaluation in the projects by our presence. Another difficulty was the time and resources available that made it impossible for the evaluators involved to meet together as a group to develop the on-site protocol and standardize approaches among themselves. Also, the on-sites were necessarily very brief, and therefore subject to all of the dangers inherent in viewing a very limited segment of each of these project's activities. Nor did the timing for site visits always optimally match the project activities; some projects were visited too early, others too late.

Most importantly, the Career Facilitation Projects are not planned variation experiments. They are a diverse set of projects around a common theme of attempting to provide educational and job-related experiences to women who hope to return to or improve their position in a science career. There are undoubtedly other project approaches that might be used, and significant variables that have not been illuminated in these projects. These deficiencies can be alleviated only by additional projects and additional studies.

Methodology

Planning for the study began in the spring of 1977. It was clear that on-site visits were called for as most of the projects had generated very little written information at that time and few outcomes could be provided. Thus what was to be learned had to be viewed first-hand. It was also clear that a common set of questions could not be asked of all of the projects, due to the variation in content as well as the different stages of maturity that they presented. Finally, a previous evaluation of NSF experimental Women's projects had found that it was of

considerable value to have at least two evaluators on each on-site team.

Given these restrictions, it was decided that only the projects funded in 1976 would be to the point of maturity to make an on-site visit worthwhile. It was also recognized that, in order to have any impact on the 1978 guidelines, some of the information would need to be available early in the summer of 1977. However, a review of activities scheduled for the 1976 projects revealed that a number could not be visited until late summer or early fall (one did not even begin until September). Thus a schedule of on-sites needed to be developed that would run throughout the summer months and into the early fall.

It was also apparent that the Foundation's staff could not undertake the study by itself for two reasons. First, there was simply not the personnel available to provide two evaluators to each site. Second, a study conducted strictly internally would raise questions of self-serving findings and credibility. It was felt that it would be better to include external evaluators, both to provide a view outside the Foundation, and to bring experience and strengths to the study not available on the NSF staff.

The procedure adopted was to enlist the aid of four external evaluators, in addition to Katzenmeyer and Lawrenz from the Office of Program Integration and the Women in Science Program Manager, M. Joan Callanan. The external evaluators selected were chosen for backgrounds in a combination of women's studies, science education, career education, and general evaluation experience. Those selected were Charles Bertram, Appalachia Educational Laboratory; Evelyn Brzezinski, Michigan Department of Education; Lee Burks, Georgia Institute of Technology, and Alma Lantz, Denver Research Institute.

As a means of introducing the study to the projects involved and to incorporate their suggestions, it was discussed at the Career Facilitation Project Directors' Meeting on May 20th. Since the possibility of external evaluation had been included in the Program Guidelines, there were no problems encountered.

The schedule of site visits was drawn up by Lawrenz. The first two were to be conducted by NSF staff, as these could be held at institutions in the immediate D.C. area and provide the opportunity for on-site protocol development and try out. After this, each on-site would consist of one NSF staff member and one external evaluator. Each external evaluator would make two site visits. Lawrenz and Katzenmeyer developed the initial on-site protocol which they used at American University. On the basis of that

experience the protocol was revised and then employed by the two of us and Callanan at George Mason, after which it was again revised. The protocol was not a rigid interview instrument, but more an outline for the site visit report that might be developed. The intent was not to provide a restrictive set of questions that should be asked at each site but to provide an overall framework or suggestive structure in which each project would be discussed. A copy of the final protocol is given in the Appendix.

The balance of the on-site visits proceeded according to the plan, with minor exceptions. The site visit to Polytechnic Institute of New York had to be delayed for a week due to the New York power failure the night before the scheduled on-site. The Chestnut Hill on-site included two NSF staff members in addition to an external evaluator, to provide the Director for Student-Oriented Programs, Lafe Edmunds, an opportunity to see the project first-hand. Finally, the Washington State on-site was conducted by Lawrenz and Katzenmeyer; Lawrenz was no longer an NSF staff member at the time that this on-site occurred.

In generating site-visit reports, the usual pattern was to have the report written by the external evaluator and reviewed by the NSF staff member that had attended the on-site. It would then be returned to the external evaluator for final draft, after which it was sent to the Career Facilitation project director for comments. In the interest of saving time, some reports were also sent to project directors when they were returned to the external evaluators. However, all individual project reports have been reviewed by the other individual on the on-site team as well as the project director.

Findings and Conclusions

The positive findings are:

(1) The 1976 Career Facilitation Projects are well run, high-quality efforts. Except for variations caused by unavoidable circumstances, the projects have done what they said they were going to do. While it is too early to make a final judgment about success or non-success for any of the projects, there is little doubt that these projects have provided an excellent test of the concept of career facilitation. None will have failed for not having been tried.

(2) The Project Directors as a whole are capable and dedicated leaders as well as administrators. Projects tend to be personalized to the individual project director and the project directors have performed extremely well. They have devoted much more time to the projects than they have been compensated for, have taken personal interest in each of the participants, and have gone out of their way to make it a worthwhile experience for each. One Project Director had

a participant and her son move in with her when the participant lacked the financial resources to continue without help. Failure, if it occurs, will certainly not be due to the lack of leadership on the part of the Project Directors.

(3) Virtually all the participants in the projects have been enthusiastic about the experience. In one sense, this is predictable, as they are participating without charge. Also, the group cohesiveness formed in most projects among the participants has led to greater satisfaction. However, the demands on the participants are great, sometimes almost overwhelming. Many of them have made substantial personal sacrifices in order to take part and they will indeed be a critical audience. Some gave up well-paying jobs and moved considerable distances to participate. Many had several hours commuting to the project, often while working full-time. Therefore, their reactions certainly attest to the value of the experience.

(4) Faculties are also enthusiastic about the projects and the participants. While the women in these projects tend to be more demanding of the faculty than the typical undergraduate or beginning graduate student, they are also willing to work extremely hard to achieve. They are goal-oriented, appreciate the faculties' efforts to help them reach that goal, and make it apparent to the faculty that that is the case. Many faculty commented that their contacts with the women in these projects are much more rewarding than those with their other students because of the focus and motivation to succeed.

(5) While it is early to make firm conclusions about outcomes, it does appear that most women are gaining useful knowledge from the projects, and most will eventually find jobs or enter graduate school. Dropouts have occurred, but mainly for reasons other than dissatisfaction with the projects or uncertainty about whether the participation would lead to a job.

The negative findings are:

(1) Participants are much more difficult to obtain than was originally envisioned. Almost all the projects experienced some difficulty in finding applicants, a number had to lower requirements in order to obtain enough to operate, and several simply failed to find enough participants to be able to practice the project in the manner intended. In a great majority of the projects, this has created a diversity in the applicants accepted that is far greater than hoped for, often with negative impacts on the instructional content and pace.

In some instances, the small number of participants is probably due to lack of adequate publicity. Many of the projects tried the traditional means of identifying students through alumnae lists or professional society newsletters and journals. Others tried the newspapers, both national and local, and a lesser number utilized other media such as television and radio. All approaches seemed to be somewhat successful, and no one overwhelmingly so. Clearly women who might be interested in this kind of a project are not easy to reach, and more innovative and personalized approaches are probably going to have to be employed in order to increase participation. Future project directors will need to understand both the importance and the difficulty of the publicity for such projects. However, the lack of participants may be indicative of a more complex problem, particularly in light of the fact that low numbers of applicants has been a common finding in other women's programs targeted on increasing participation in science. It may be that the pool of women either eligible or interested in projects of this nature is not as large as some have assumed. It may also be the case that projects will need to go beyond publicizing the availability of the project to new techniques for encouraging participation.

(2) Few, if any, of the current projects have high probability of continuation in the original form without outside money. In part, this may have been due to the program specifications, as there was no mention of the possibility of renewal, therefore discouraging a major motive for continuation. This has been altered through the change in the 1978 guidelines. However, in a number of the projects, continuation has not been a high priority for the department or the institution. A number have treated it like most federal grants - as a source of money to be used while it is available, and to be forgotten when it disappears.

Recognizing the limited amount of information about continuation now available, the following interpretations are given as hunches to be followed up in later studies.

A Career Facilitation Project is more likely to be continued where: (a) The institution needs the students, and sees the project as a way of recruiting them. The implication is that the prestige universities are less likely to continue. (b) The institution and/or department in which the project is housed sees its role as applied. The more pure or theoretical the host organization, the less it is going to put into a career facilitation project. (c) The project director is a permanent staff member of the department. (d) The project director is highly committed to women in science activities. (e) The project director is a woman and/or

at least some of the other staff members are women.

(3) Almost all of the projects attempted to achieve more than is realistically feasible. To some extent this is a normal learning process for any institutional offering. They will overshoot the mark in the first attempt and will become more realistic as the experience is repeated.

However, it appears that in some projects the heavy amount of work reflected a lack of specification of outcomes and the activities represented a smorgasbord of possibilities - something for everyone. There is a need to clarify exactly what group each project is intended to serve and what that particular group is going to need. This, of course, will make it more difficult to obtain large numbers of participants using current publicity techniques.

(4) The projects, with a few exceptions, are not heavily job-skill oriented. They tend to be academic undertakings, not too different from what the departments in question usually do. It must be pointed out that some of the projects never intended to be anything but an academic review activity. Others, however, made more serious claims about the career payoff for this experience, and several oversold what they actually had to offer in this area. A few need to review their publicity materials to clarify and sharpen what it is that they are actually going to provide. This could help prevent unrealistic expectations on the part of participants.

(5) In a great proportion of the projects, the evaluation procedures for determining student outcomes are extremely informal, (sometimes almost non-existent) or are generally irrelevant to the specific objectives of the project. This again could be expected in a new set of projects operating in an as yet uncharted area and the informality is quite appropriate for formative evaluation of small projects where the Project Director is in daily contact with the participants. But it is a matter for concern in the future, as a type of documentation that would be useful about what students actually are or are not learning is not likely to be available. Further, most projects collected inadequate baseline or entering skills information about the participants; not knowing the strengths and weaknesses of their participants led to unproductive instructional activities at the outset.

The following is an expression of concern about the Women in Science Program and the Career Facilitation Project component in particular with reference to internal NSF organization and

and planning. The overall support for the Women in Science program is $1M per year, of which approximately $700,000 has been devoted to Career Facilitation Projects in FY 76 and 77. Since the average cost per project is about $70,000 and the average number of participants is about 25 - 30, there will be about 10 projects per year reaching about 250 - 300 women.

A case can be built that since the Career Facilitation Projects are aimed at improving the scientific work force they should remain in the Science Personnel Improvement Division. A case can also be made that this is an institutional program, as the support is given to the institutions to develop a program, and thus should be located in the Science Education Resources Improvement Division. However, the size of the program argues strongly that it is unrealistic to treat it as a block grant program similar to those already in either of these Divisions. The only rationale that can be made for Women in Science, and particularly the Career Facilitation Projects, is as experimental programs trying various mechanisms to find which are successful or unsuccessful, with the hope that these ideas will be picked up by institutions that do not have grants as well as those who do. As such, it is a research, development and demonstration effort regardless of where it is administratively housed in the organization. The danger is that by locating the program in Divisions committed to block programs, it will also be seen as a block program, both by NSF decision makers and potential grantees, and that is nonsensical given the size of the budget.

Comments and Observations

The following comments and observations are not intended as either positive or negative statements about the Career Facilitation Projects, but do relate to future functioning of the program as a whole.

(1) Location of projects is clearly a critical variable. To be successful the project must be located in an area where there is a substantial number of women with science training, and a large number of potential employers. There were exceptions; some women traveled to projects from great distances. However, most participants are going to be from the immediate area of the project, and it is essential that that area be able to provide the necessary participants if the project is to be successful. The implication is that most of the Career Facilitation Projects should be located in urban areas.

(2) The issue of support for participants cannot be ignored. The new guidelines permitting some participant stipends will be helpful, but certainly will not address the whole issue. If participant support is minimal, the program will be vulnerable to the criticism that it is providing experiences for those who economically need it least. This is particularly the case with women who are under-employed; often they have no other source of income and cannot alter their situation without some assistance. While it is totally unrealistic to consider full participant support within the current budgetary framework, it might be possible to explore means by which industry and government (Federal, State, and municipal) would cooperate in the support, if the total burden was not placed on these potential employers and if the pay-off for them was made very clear. This would probably require having industry and government as full partners in the planning and in the execution of the projects. Such an approach would have additional potential benefits for job placement and specification of job skills needed.

(3) Experience with the first set of projects indicates that it is unrealistic to expect that an experience of this duration can create the equivalent of an undergraduate degree in science or engineering, unless the participant already has that degree. In other words, a physics project can expect to have outcomes equivalent to a undergraduate physics degree only with those participants that already have an undergraduate physics degree and are essentially reviewing; for those with chemistry or mathematics major, they will not have the equivalent of a physics major. But they will have a special type of inter-disciplinary science training that is probably equivalent to a bachelor's degree, if such a degree existed.

To achieve the equivalent of a specific undergraduate degree should be seen as a goal rather than an objective of this program, unless it is to be limited to projects that provide for review and updating for women only within their field. In our opinion, the latter would be unfortunate, as many of the participants wished to change their scientific discipline. Further, the number obtaining jobs on the basis of having participated in these projects suggests that employers are willing to recognize the value of this effort. For women wishing to return to a scientific position or the prepare for a more rewarding job, their maturity, stability and evidence of ability to complete the Career Facilitation Project are probably as important as the particular courses they have taken.

(4) It is still an open question whether academic departments, in general, are really going to be able to respond to an effort such as women in science. Departments are willing

to carry out a project as long as it is only a small deviation from what they usually do anyway, and the participants are not too different from what they would expect in their undergraduate or beginning graduate student body. But most of the women who participate in this program want jobs, not academic training, per se. This is likely to call for a program that is far different from a crash review with a few practical applications added that many departments would be willing to offer.

The defense that most departments would give to the academic approach is that a scientist must have the theoretical background to compete effectively in the real world. If so, academic departments are already prepared to do this; there would seem to be minimal gain to be achieved by having the Career Facilitation program. It would probably be as effective to offer free tuition to a selected group of women, and certainly less expensive. This would also provide greater freedom for the participant. Other approaches could be employed to provide the group esprit de corp among women graduate students.

(5) As mentioned earlier, the Career Facilitation Projects may be making unrealistic assumptions about the pool of talent available. The program evaluation study of the Career Facilitation Program now being designed should provide some of these answers. On the basis of the experience to date, it is debatable whether there is a large number of extremely well-educated, and academically motivated, women who will wish to have this type of experience. It is at least as likely that women with these qualifications do not need a project; they may well have already found other alternatives. And even when a project does locate well prepared participants, as several did, it is unknown whether this could be continually repeated if the project would be institutionalized. What the projects may have to deal with are women who are not highly academically prepared or do not have any particular interest in seeking higher academic degrees. This is a far different group than most traditional academic departments are prepared to deal with.

The rationale for the Career Facilitation Projects need not include encouragment or discouragement of the attainment of further academic degrees; what is critical is that alternatives remain open for the participants. A number of participants we spoke with did not wish to pursue graduate work, even though they might have been identified as having the potential for this. However, they might change their minds later as they have further experiences.

What appears likely is that projects may well need to draw women who do not enter with the necessary academic preparation or academic motivation that immediately encourages advanced graduate work.

(6) It has emerged in these projects that a particularly large group of women who have an interest are those who already are or have been science teachers in the elementary and secondary schools. The program was not envisioned for this group, but rather for those who held degrees in the pure sciences. Yet many school teachers are looking for a change in career for a variety of reasons: lack of tenure, low pay, no jobs in the area desired, or simply that teaching is no longer rewarding. Regarding teachers, timing of the projects becomes critical, as those who are currently teaching have contracts that must be signed in the spring and they need to be informed early if they are to participate in any project.

(7) Another concern that has emerged is that of the relatively large number of foreign-born women (some of whom are non-citizens) in the projects. In both 1976 and 1977, they represent a substantial minority, particularly in projects on the east and west coasts, and along the southern border of the U.S. Reviewing credentials for these applicants is very difficult. Many of the foreign born and trained are extremely well-prepared in science, but are unable to locate a scientific position in this country. Others hold science degrees from foreign universities but are not particularly well trained. Many have the usual difficulties of language and will present special problems for placement.

Non-citizens are eligible to participate in these projects, but the Foundation may wish to determine as a policy issue to what extent this clientele should be served.

(8) One aspect of the Career Facilitation Project that deserves further study is the importance of career development and job readiness skill learning. Most of the projects included this, but there was considerable variation in approach and amount. Almost all of the participants we interviewed felt that the counseling, vitae preparation, job interview simulation, and other approaches used were helpful, although it was also clear that assertiveness training and group counseling techniques developed for the traditional female undergraduate must be modified for use with these women.

What should be done to assist women in these projects to better understand their career opportunities and how to most effectively search for a job cannot be identified without clearly specifying the nature of the participants; those who are employed will need different inputs than those who have been out of the work force for a substantial amount of

time. However, it is evident that women in these projects express a need for assistance here, and it is reasonable to assume that this is an area that can be forcefully addressed in projects of relatively short duration and intensity. A primary concern must be to increase the relevance of these activities for the non-traditional student, particularly here the mature woman with a science background and interests.

(9) A final issue is the importance of the participant group's cohesiveness in the projects versus the opportunity to function in the institution as a regular or nearly regular student. It is very clear that a number of projects developed considerable esprit de corps and this was extremely helpful to many of the participants in getting through the work expected of them. For some women, this very well has been the critical factor; for others, while it was clearly appreciated, it was not essential. On the other hand, by allowing the women to operate not as a self-contained separate unit, but more like other undergraduate or graduate students at the institution, they have a broader opportunity to participate in that institution and gain experiences that are more generalizable than those with the self-contained group might be.

There seems little question that many of the participants were in need of success experiences and an opportunity to be eased into academic competition. However, the evaluators have different minds regarding whether this need by done through the cohesiveness of a self-contained unit. Several feel cohesiveness is extremely important, while several feel integration in the regular program is more critical. One implication is that if a project is not going to be strictly self-contained, there is still good reason to attempt to create an esprit de corps among the women in science departments by attempting some special programming for them. This is particularly true for the older students, who feel they do not fit into the usual academic mold and need the reassurance of others around them as they begin to reestablish skills that may not have been used for a considerable period of time.

A Classification of Participants and Projects

While these 11 projects and the women taking part in them can hardly be regarded as a representative sample, certain categories emerge. Women bring different needs to these projects and the projects have different emphases. This is an initial attempt at a structure that matches participants' needs and project rationales. In the interest of highlighting the categories, the nature of both the participants and projects has been greatly oversimplified.

Participants can be classified into one of three groups:

(1) Those who are out of the work force and who wish to return gradually. One typical example of the stereotype of this group is the wife and mother whose children have reached the age where she no longer feels the need to be in the home full time. Although she holds a degree in science, she may never really have been in the scientific work force, either having been married shortly after college, or having held a job that did not really use her scientific background. Self-assurance and commitment to a science career are likely to be problems. Her husband and children may or may not be supportive of the return to school. Even if supportive, there will be stresses due to the change in routine and she is likely to feel some pressure, external and internal, about being unavailable for family activities and responsibilities that previously she could carry out. She is likely to want a part-time job at the end of the project.

(2) Women who are willing to make a full-time commitment to entering a science career. This woman is very different than the one described above as she has decided that for her it is necessary that she enter or reenter a scientific career on a full-time basis. She may be married and have children, although it is less likely than in the first group. Even if she has children, she chooses to return to a career much earlier than the woman in the first group, often while the children are quite young. Her decision to take part in the project may be linked to a personal change in her life, such as divorce. In fact, she may need a job for economic survival. In contrast to the woman in the first group, commitment and self-assurance are much less of an issue. She knows far more where she is going and why; thus, her participation is much less likely to be tentative.

(3) Women who are already working who wish to shift careers. This woman already has a science position, but is dissatisfied with what it provides. (A pre-college science teacher is one example.) She is also less likely to be married and have children than the woman in group 1. Unlike the women described above, she is more likely to be working because she economically must, and finances are therefore much more likely to be critical. Location and scheduling of the project such that it can be coordinated with her job will determine whether she participates. If anything, she is even more goal oriented than the women in group 2, because she knows exactly what she wants the project to do for her.

She is also less likely to have academic interests or motivations to do advanced graduate work.

There are also three types of educational experiences that the projects could provide, plus a fourth, default option which is no specialized project at all.

A. Updating. This project simply attempts to provide intensive review with some introduction to new content areas and instrumentation. Given the limited amount of time available, the material is necessarily telegraphed and somewhat simplified, but is quite broad in its coverage. This approach makes no claims to being a career preparation beyond that which an undergraduate science degree provides. Selection is probably less critical for this program than for the others discussed below, as long as the participants have some basics and can handle the mathematics required.

B. New career direction. This approach definitely makes claims for providing a new career for the participants. It attempts to retrain or to redirect on the basis of the background of the participants. There is little emphasis on updating, beyond what normally occurs in any course as a precursor to new learning. The background is assumed, and thus selection becomes critical.

C. Combination of updating and new career direction. This project attempts to have some of each of approaches 1 and 2. It is probably most like what was actually done in most of the projects. Selection is somewhat less critical than with option 2, but certainly more so than with option 1. The difficulty with this approach is one of time in the attempt to fit too many activities into a limited number of hours.

D. No program. Certainly one option is to have no specialized program, but simply to allow women to participate in the existing instructional programs of various institutions. It is included simply to examine what would happen to each of the different groups of participants if some kind of program such as Women in Science did not exist.

The three groups of participants and four project options have been combined in Table 1. Any conclusions drawn must be heavily qualified, and neither projects or participants will ever occur in the simplistic manner in which they have been presented. Yet there are some general trends that emerge.

(1) For women who are out of the work force wishing to return gradually, the best project option is updating, as new career direction or a combination would probably require more commitment than they are ready to give. While participation in the more intensive projects is quite possible in the future, there will need to be an interim stage that gives these women an opportunity to test their motivation before a full commitment is made.

It bears repeating that projects targeted on women gradually returning to the work force must recognize the need to encourage and foster motivation and commitment. Projects cannot assume that the commitment will already exist, as the lifestyle change faced by these women is bound to create confusions and self doubts that may be reinforced, both subtly and openly, by family and friends. A return to school or to the work force is all too often seen as a rejection by those close to the woman.

Assuming there is no special program available, some of these women will return to school on a part-time basis. However, lack of any support group would indicate low probability of completion, at best a long period of time for this to occur, and possibly not in science.

(2) Women willing to make a full-time commitment will probably not be satisfied with just the updating approach, but will wish something more clearly career related. The combination program could be very appropriate, with its emphasis on review as well as career preparation. The real issues are going to be whether such projects can realistically cover both updating and skill acquisition in a reasonable time, and whether jobs actually do result. These are major hurdles and will require careful selection of participants to take advantage of the opportunity.

Without a special program, this is the group most likely to return to school, as the commitment and focus of these women will result in some action taken. Whether they return to an academic background and educational setting or search for a job immediately will be determined by economic considerations. Those with strong academic credentials may receive assistantships, and they will probably return to school; those with more marginal credentials will not and they will probably be lost from the scientific work force.

(3) Women who are already working will need the least amount of updating, unless they are currently in a totally unrelated field. The critical issue is economic; they will participate only to the degree that it is economically feasible for them

to do so, and the experience gained will lead to a position that is better than what they already have. A new career direction is what they want, and the project will work if it meets these requirements. Experience has suggested that employers will not provide the support for these programs; if they are interested enough in the woman to provide support, they will also resist any effort that might lead to losing her.

Without some type of special program, some of these women will take courses, even an M.S., where the job pay-off is clear. However, they are not particularly interested in courses simply out of academic motivation; most will find the benefit to be too little for the cost and effort required.

Recommendations

From the conclusions and observations drawn, the following recommendations are made:

Program Guidelines and Proposal Review Procedures:

(1) Proposals should clearly delineate who the project is targeted at, the specific activities that will occur, and the expected outcomes.

(2) Proposals should identify a clear need for the project which includes evidence of an adequate pool of potential participants in the immediate area. If such a pool does not exist, the proposal should provide evidence that appropriate women will move to participate in the project.

(3) Proposals should clearly outline the publicity procedures to be used and the probability of success that might reasonably be attained. Special emphasis should be given to matching approaches to be desired participant types. Where the number of applicants is likely to be low, publicity should go beyond announcement of the availability of the program to techniques for encouraging participation.

(4) In addition to requirements already in the guidelines, proposals should specify evaluation procedures that will indicate how prerequisite knowledge and skills or participants will be determined, what feedback procedures will be employed for informing project staff and participants about progress, and how knowledge, skill, and attitude changes of participants will be judged.

(5) Proposals should outline a plan for institutionalization that details what steps will be taken to establish the viability of the project that do not depend on perpetual federal funding.

Career Facilitation Program Directions:

(1) The program should experiment with cooperative project ventures involving universities, government and industry that would provide participant support and job experiences during the project.

(2) The program should explore whether academic departments are appropriate locations for career projects; perhaps direct funding to industry or training centers would be more effective.

(3) The program should experiment with more projects aimed at upgrading skills of women with less than superior academic preparation, or with inapprorpriate preparation. To what degree can English majors be retrained for science careers using the Career Facilitation approach? Which science careers? What are the critical elements in success and failure?

(4) The program should experiment with various approaches to group cohesiveness among project participants. Is it essential for the project to be self-contained? Will participants develop their own cohesiveness if not self-contained? What are the important components in establishing cohesiveness?

Science Education Directorate:

(1) The Women in Science program should be moved from the Science Personnel Improvement Division to the Development and Research Division, or research and development units should be created within the SPI, and by implication, the SERI Divisions. If the latter is chosen, it must be recognized that the block grant strategy is likely to be of limited value for R&D; most of the awards will probably be one-of-a-kinds, with far more intense monitoring than is possible in block grant programs.

(2) As a final recommendation, the Science Education Directorate should use this study as a model to be employed with recently established programs. Without great expense or unreasonable time demands, it provides program staff and OPI with an early working knowledge of how the projects are operating and problems encountered. An optimal time is during the second year of operation, as was the case here. There is seldom

enough time between making the first-year award and preparing the second year guidelines to expect to make any program changes then. It is in the third year that changes can realistically be made, and this type of study provides information for that purpose. We also used the study results in the individual review of third year proposals as the competition was limited to the 11 FY 76 projects and all had been visited. This will not likely be feasible for other, larger programs but the general summary should be useful to review panels.

Table 1

Matching of Participants and Projects in Career Facilitation

PROJECTS	PARTICIPANTS: Women out of work force wishing to return gradually.	Women out of work force willing to make full-time commitment.	Women already working who wish job change.
Updating	Best match if project is operated part-time.	May attend if given full-time. Probably not career-oriented enough for this group.	May participate if scheduling is appropriate. Probably have less need for this than other groups.
New Career Direction	Probably too much work and too much commitment for this group without some transition phase.	Will probably work if the problem of up-dating is not too severe.	Best match if project has appropriate scheduling, the shift is realistic in terms of background, and jobs are available.
Combination	Probably too much commitment but may provide a stepping-stone if the project extends over a substantial period.	Best match if full-time jobs are a strong probability. Financial support will be critical for many.	Probably will not work as the time commitment is too great for the potential pay-off.
No Program	May take occasional course. Will miss the group support and be less likely to continue. Will take substantial amount of time.	Many will become full-time students if it is economically feasible.	Some will attend night classes if the pay-off is clear.

Individual On-Site Reports

I. General Information

Site: American University, Washington, D.C.
Project Director: Dr. Nina Roscher
Focus: Chemistry
Budget: $108,410
Expected Number of Participants: 40
Date of Visit: June 2, 1977
Evaluators: Frances Lawrenz, Conrad Katzenmeyer

II. Project Overview

The American University Project provides an intensive review of undergraduate chemistry in four areas - physical, organic, analytical and biochemistry. The project is organized as a separate entity within the Chemistry Department program. Students participate as a group and generally do not take other regular courses.

The project's instructional program consists of lectures and labs in the four areas of chemistry; each is given in a block by a different faculty member. Fifty percent of the time is spent in lecture and 50% in the lab. Lectures on job placement are included in the last week of instruction. Two different sections of the project have been run: Fall '76 and Spring '77 semesters for a total of 28 weeks, four hours per day, 5 days per week; and an intensive summer section of 14 weeks, 8 hours per day. Twenty-one students participated during the academic year and 10 during the summer.

American University is a private institution located in the Northwest section of the District of Columbia. It offers a full range of undergraduate and graduate programs through the doctorate. It has a total of approximately 13,000 students: 6,000 undergraduates, 4,000 graduate students, and 3,000 non-degree students. The Chemistry Department has 11 faculty members, 35 undergraduate majors and 78 graduate students.

III. On-Site Procedure

The two of us spent the entire day at American University. We attended a lecture on polymers and observed laboratory activities. We spoke with the Project Director, three faculty members involved in the project (one was on leave), the Chairman of the Chemistry Department, the Associate Provost for Academic Development, and 10 of the 20 participants who had completed the project during the academic year. We did not interview current participants as they had just started the program. We also reviewed file materials on applicants.

IV. Process Evaluation

The impetus for the project came primarily from the Chemistry Department, which has a strong commitment to the education of women. With four female faculty members, American University's Chemistry Department is the second largest in the country for female faculty representation. The University does not have a large program in continuing education. The administrative outlook was that the project was running well and posed no problems. The feeling was that it was a philosophically sound idea, and as it required very little of them, they were willing to have it. There is no long-term institutional commitment to continuing the project.

The Project Director is an Associate Professor and also a Dean. She is very active in professional organizations and has obvious strong organizational abilities. The project's instructional staff are all experienced teachers and researchers with considerable interest in the project.

The women's program had the use of a general chemistry lab and large seminar room, and instructor's time was arranged to allow them to teach multi-hour periods. However, some scheduling difficulties were encountered during the academic year. The women were not scheduled into an organic lab for their organic component because other classes were in it, and the classroom was preempted occasionally for various other uses.

The participants had access to other campus facilities, particularly the library and the computer center. However, they had experienced some difficulty in the use of the library as they were on campus for only a short period of time and found reservations for over-night books and other procedures did not fit their 10 - 2 schedule.

The educational program provides an appropriate mix of activities and it is focused at an appropriate level. Lectures begin with simple, interesting applications and then move to more formal, structured learning. It provides a basic review of undergraduate chemistry. The review does not have the breadth of the undergraduate curriculum, but does provide a considerable depth in the topics covered. The balance of the lecture and lab appears to have worked well. The opportunity for experience with many types of instruments and laboratory procedures has been a definite plus.

Publicity for the project was handled primarily through advertisements in the newspaper and in the Chemical and Engineering News. In fact, many of the participants heard of the project through word of mouth, e.g., through scientist husbands who may have seen the advertisements. Selection procedures emphasized undergraduate chemistry background and general science training. Interview impression played a major role in decision, in addition to the materials submitted by the placement procedure in the project; however, the Chemistry Department has an informal network to many potential employers in the Washington, D.C. area and has expended considerable effort in publicizing the projects and

identifying potential employers.

Management of the project in the first phase was hampered by the short lead time as they chose to begin the program in fall semester only two months after the award was granted. There were a number of initial difficulties, particularly in the delay of the delivery of the equipment caused by the United Parcel Service strike at that time, but the difficulties encountered early in the fall semester were overcome. The project is now in its second round of participants and is running very smoothly.

The staff is well suited to the project. The Project Director oversees all of the aspects of the project in a very competent manner. She does not stay in close contact with the individual participants but rather leaves this to the individual faculty member. All faculty members are in sympathy with the philosophy behind the program and are committed to helping the women succeed. They appeared flexible, willing to change content as needed, competent, and genuinely interested in the students. They spent much more time than required working with the students, particularly in lab, and are enthusiastic about science, transmitting this to their students.

The participants have varied backgrounds. Most have undergraduate chemistry majors but there are a few from biology and other sciences. Overall, they were C+ to B+ undergraduate students. Age varies widely, but most have been out of school for a number of years.

The participants are enthusiastic about the program and apparently studied hard. They appear self-confident of their ability and pleased with their accomplishments. They feel that participating in the project involved a great effort on their part, and they were reluctant to give any more, e.g., buy books. Many of them have restrictive job requirements (e.g., part-time or work at home) and were somewhat disturbed that the jobs available did not fit those requirements. They would have liked a much more extensive effort in job placement on the part of the project. The general feeling seemed to be: "I've worked hard and I deserve a job."

V. Outcome Evaluation

The project has increased the participants lab skills, self-confidence and theoretical knowledge of chemistry. Gains were demonstrated on the chemical society examinations employed.

Participants felt they had benefited from the experience. It is their feeling that very few of them were ready for graduate work in chemistry at the outset. After having the project all felt they could do Master's level work and several are in fact doing this.

It is too early to make a judgment on job placement other than the four who had already located a job and the two who have chosen to continue in graduate school. The participants voiced considerable concern about finding a job, but faculty members felt that all would

indeed succeed in time, even those seeking part-time work. As the faculty at American University are in close contact with most of the potential employers in the area, this appears likely to occur.

The department and American University are also likely to benefit from the presence of the project. The faculty was impressed with the capability and especially the motivation of the group. Several commented on how much more rewarding the instruction of this group was than the typical undergraduate or beginning graduate class.

For the institution, the project provides one means by which American University can move into the areas of continuing education and women's studies. As AU has not had major commitments in these areas in the past, this could provide a first step in reorienting the faculty directly involved as well as the institution as a whole.

VI. Summary of Reactions

The project has been successful in identifying women who needed updating in chemistry and providing them with useful and appropriate material. While it is impossible to provide the equivalent of a bachelor's degree in two half time semesters, the project has achieved a great deal in the time allowed. It was probably a mistake for the project to attempt to begin in the fall semester with the limited lead time possible. However, they coped well with the problems. The participants are very enthusiastic about the project and it is clear that where many were only considering the possibility of looking for work before the project, a great proportion will now be actively seeking a job or more advanced training.

VII. Recommendations

There are three areas where project changes might be made: (1) attitude development, (2) communication, and (3) study. It might be beneficial to provide attitude development to encourage a stronger career orientation in the participants. This would help the project achieve more impact on the numbers of women employed in the sciences. It is apparent that one of the project's tasks is to increase the professional commitment of these participants. While this has happened, it might be given a more central focus. In the area of communication, more formal channels for expressing dissatisfaction or giving suggestions might be developed. This could be accomplished in conjunction with a more extensive formative evaluation effort. In addition, more time might have been spent with the participants on establishing methods for personal contact and support and on introducing and explaining the purpose and expectations of the project. There seemed to be little provision for study time or study facilities.

For the Career Facilitation component of the Women in Science program, the following suggestions are offered for consideration: (1) There could be considerable gain if the projects could be linked with part-time internship experiences in industry. This would help to ease financial burdens and provide practical training. It might also be an effective means of placement, offering both the woman and the potential employer an opportunity to become acquainted in the work setting. If the faculty reaction to these women is any indication, they are likely to do very well in internship placements and might even convince them of the value of part-time positions. However, it is unlikely that most industries will be willing to absorb the total cost. Perhaps they would be willing to split the cost, with NSF picking up the rest.

(2) A major function of a Career Facilitation Project that deals with part-time participants is to instill career commitment. This should be clearly stated in the guidelines and project proposals should be judged on the probable success of their plans to accomplish this. Having such a requirement would sensitize participating faculty members from the beginning that their efforts must extend beyond the traditional academic role.

I. General Information

Site: University of California at Davis, California
Project Director: Dr. Richard Dorf
Focus: Engineering
Budget: $64,531
Expected Number of Participants: 20-40
Date of Visit: July 19-20, 1977
Evaluators: Alma Lantz, M. Joan Callanan

II. Project Overview

The purpose of the project is to retrain women with degrees in math and science so that they will be eligible to enter the job market as engineers at the B.S. level or will be able to compete successfully in graduate programs in engineering.

A recruiting plan attracted 40 women who earned B.S. degrees in mathematics, physics, chemistry, computer science, or engineering no less than two, nor more than 15, years ago. Applications were received from 87 persons; 58 of them were accepted; 40 of these came.

Participants will receive an educational experience which gives them a core of fundamental engineering courses and whose format takes into account their needs as reentry students with family and job responsibilities. Participants will attend an intensive two-week, on-campus summer session to review mathematics, physics, and computer programming. Throughout the remainder of the academic year they will commute to intensive weekend instruction sessions taught in the Bay area, initially at least at the Lawrence Hall of Science. A second two-week summer session will complete the program. All women will be offered the opportunity to gain practical experience through cooperative engineering jobs. Assistance with placement in permanent jobs will also be offered. Participants completing the program will receive extension credits and a certificate of completion.

The sponsoring institution for the program is the University of California at Davis. The University is part of the state system, and all high school seniors in the upper 12 1/2 percent of their classes are eligible as students. The student body has an enrollment of approximately 117,000 students, concentrated in the sciences, applied science, engineering and agriculture. The university has a large "work-learn" or internship program for its students.

The project is housed in the Extended Learning Division. The University Extension is the continuing education service of the University of California enrolling about 22,000 students. U.C. Davis Extension programs offer individuals opportunities for personal growth and

professional development in 29 northern California counties. Although many programs are designed for those who have attended college, most courses are open to any adult who can benefit from university level study.

Extension programs cover a wide range of subjects and employ a number of unusual teaching techniques. The programs vary in length and format, from one-day conferences and short lecture series to courses of two or more quarters and certificate programs requiring up to several years to complete.

The University Extension also has a small part-time degree program for engineers and for nurses, although these programs are theoretically being phased out. The division also offers various kinds of counseling and courses for reentering students. The division has systematically attempted to address some of the needs of reentering women students, e.g., the University Extension's Women's Program has reached an estimated 900 women over the last two years of course offerings.

III. On-Site Procedure

Tuesday, July 19, 1977

6:00-8:00 PM	Dinner at Dorf's McCoy - Extension Specialist Soderstrand - Review Math Teacher Frohreich - Project Coordinator Dale - Computer Sciences Teacher Callanan - Evaluator Lantz - Evaluator Dorf - Project Director
8:00-10:30 PM	Meet with participants, Tercero Lounge

Wednesday, July 20, 1977

8:00-9:30 AM	Breakfast with Mike McCoy & Donna Frohreich and Stephanie Twomey - Project Evaluator
9:30-10:45 AM	Examine project records - UNEX conference room
11:00-12:00 N	Sit in on Physics class (Roessler Hall, Room 66)
12:00 N-1:00 PM	Lunch with Physics instructor (Walt Wyckoff) and EE Lab Instructor (Ed Fields)
1:00 PM	Sit in on EE Lab
2:00 PM	Meet with Dick Dorf
5:30-6:30 PM	Dinner, Tercero Dining Hall
6:30-9:00 PM	Student informal meeting with Dorf

All persons listed on the schedule of activities, including the entire group of participants, were interviewed. Student applications and files, professors evaluations of students, and classroom instruction were observed.

IV. Process Evaluation

The project objectives are closely connected with those of the division, e.g., providing nontraditional education for the nontraditional student. It is at odds, however, with the way that the University, as a whole, envisions its mission, e.g., the university is generally geared for the 18 year old "straight through" student.

The staffing of the project appears to be typical for the Extension Division, (drawn primarily from non-faculty) and contracts have been drawn up on schedule with the visiting faculty members. The facilities available for the summer sessions on the Davis campus are adequate and pleasant, including dormitory space, eating facilities, engineering labs and classrooms. There was, of course, the inevitable problem with obtaining adequate computer time that appears to have been resolved. The weekend sessions will be held initially at the Lawrence Hall of Science in Berkeley, an outstanding facility for this type of endeavor. No arrangements for weekend housing have been made by the project staff for the weekends, and this housing may present a minor problem for the participants.

The educational component includes a review of math, physics and programming, courses in circuits, statics, properties of materials, electronics of circuits and systems, dynamics, fluid mechanics, mechanics of materials and thermo-dynamics and a two week session in instrumentation systems. The content of the course was devised by the Advisory Board. The standard engineering curriculum was presented to the board, comprised heavily of industrial representatives, with a few faculty members. The advisory committee agreed on the critical elements that needed to be included in the curriculum and instructors were asked to structure their courses around those critical elements. It is anticipated that this will produce a strong preparation, and reflect in high scores on the National Engineering Exam to be taken at the end of the project. The absence of focus on theory, however, may be detrimental to those wishing to pursue graduate education.

The students have also had field trips to two industries to meet and observe their female engineers. While these role models were not met by the evaluation team, the participants commented that none of the role models had "historically intact" marriages. The delivery of the courses will be fairly traditional classroom instruction in concentrated time periods, e.g., two weeks during the summer (about ten hours a day) and 26 weekends (also ten hour days).

The publicity for the project was a mixture of traditional and nontraditional means. The traditional methods included advertisement in catalogues and letters sent to alumni. Most of the response was solicited from nontraditional direct advertising in a variety of local places (e.g., NSTA journal, ads in feminist credit unions and bookstores, San Francisco Chronicle, etc.). Judging from the response, the publicity must have been good.

The participants were selected by a screening for the minimum requirements--adequate number of courses in math and physics, bachelors or masters within the last 15 years, and so on. The applicants were asked to send their transcripts and to complete some essay questions. On the basis of these documents, a committee of three (one representative from private industry, one from the public sector, and the project coordinator) selected approximately 60 from the 87 completed applications. It was commented that time and opportunity to interview the applicants would have been helpful.

Evaluation procedures--Very detailed evaluation procedures are planned. These procedures include tracking participants, those selected but not attending, and those not selected. It is a comprehensive evaluation, and if an error is being made, it is in the direction of excess.

To date, counseling by staff members has been somewhat sacrificed for course content. The actual format, scheduling and content of the counseling activities has not yet been definitely developed, although a night "rap" session was observed by Joan Callanan. The principal investigator has expressed the opinion that more extensive counseling should be conducted with the participants.

Management of proposal development and project activities are split between three principals. Dr. Dorf, the principal investigator, has key management responsibilities and has maintained close contact with the project by serving a variety of roles including lab assistant, counselor and social visitor. Ms. Frohreich has overall project coordination duties, and Mr. McCoy has responsibility for obtaining course approval, conducting negotiations with faculty, obtaining space, and so on. None of these people will act as faculty; rather the instructors have been drawn from the university and industry.

In general, the project is on schedule. Some minor slippage in screening applicants occurred and some of the counseling activities have not taken place. More importantly, the participants were promised a course and reference outline prior to project initiation and were disappointed that they did not receive one. A slight logistical problem has occurred because the project coordinator is a consultant living in another town. Previously, she had to send letters to Davis to have them typed, etc., although support staff is going to be made more available to her. In general, the project

seems to be running fairly smoothly considering the disparate locations and division of duties of the principals, although they report spending more than allocated by the budget.

The project director appears to be very committed to the project, well qualified to complete it, and is well liked by the participants. The most visible other staff member is Ms. Frohreich. Ms. Frohreich, with a background in counseling, is also committed to the area, well qualified and well liked. There will be eight individuals teaching the various sections, three of whom will be women. Four of the faculty were interviewed by the evaluators. The faculty members were very carefully chosen for teaching skills, background qualifications and industry experience. Dr. Nell Dale, Project Director of the Facilitation Project at the University of Texas, volunteered to teach the computer science review course. She is living in the dorms and is very accessible to the students. The faculty members we met were pleasant and not condescending.

Advisory Committee--The Advisory Committee is composed of 15 members including Dr. Dorf, who serves as Chairman. Five are from universities, nine from industry or government, and one from the Commission on the Status of Women. Several of the 15 are women.

The participants appear to be distinctive in several ways. First, there is a high proportion of participants with Asian backgrounds: Filipino, Vietnamese, Japanese, Chinese. Secondly, a majority were employed at the inception of the program, and about five of these women are retaining their jobs. Of those employed, 17 were high school teachers who felt that teaching was a dead end for them. About 13 of the participants are currently considering graduate school.

The women appear to be at least average in intelligence, and above average in motivation and commitment to the project. Many stated that they had been actively looking at engineering careers prior to reading the announcement of the program. Their commitment is evidenced by the $1,000.00 they expect the program to cost,[1] and the arrangements that had to be made for their families in order to attend the two week session. All appeared to be putting a great deal of effort in studying and sounded like a typical group of freshmen in moaning about their workload. The enthusiasm and spirit of the group was high. The enthusiasm was enhanced because of the group experience, the commitment to getting an engineering job, and their perception of influencing the form of the program.

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[1] Some of the participants felt that availability of loan funds would be helpful. Only a few felt that the program should not cost the participant.

V. Outcome Evaluation

Because of the recency of project inception, very little about outcome on participants can be suggested. A slight, but probably favorable impact on the faculty may be expected; e.g., industrial personnel may gain increased understanding of the problems and capabilities of these and similar women. Although the project has gained moderate visibility, it is not a novel approach for the Division of Extended Learning and will not likely affect the attitudes of the institution. It will, however, increase their capability in continuing to offer this and similar courses. At this point there is no known impact on other institutions.

Dean Dorf is enthusiastic about the project and has considered a variety of ways to continue the program in the absence of NSF funding. One possibility that he is currently planning is to continue the intensive on-campus summer review as developed through the NSF program and the career development through the Extension Division, with the engineering courses content being absorbed by the Engineering Department. Some of the noncompetitive "spaces" reserved for reentering students may be used for this purpose. Another alternative mentioned was to offer it as a "for fee" course through the Extended Learning Division, leading to a certificate, although the price to the participant was expected to be at least $1,500 if this alternative was chosen. We received mixed comments regarding the supportiveness of the Dean of the Engineering School, whom we did not interview.

VI. Summary Reactions and Recommendations

The most positive features of the program are:

1. its ability to attract motivated women;

2. its ability to attract already-working but underemployed women;

3. its scheduling;

4. its "live-in" group experience for the participants;

5. the internship offered;

6. the intention to administer the National Engineering Exam.

None of the features of the program can be judged negative at this point. However, we have some reservations about the impact of a consultant living in another city running the program. Further, greater use might be made of nontraditional instructional methods such as CAI or TV capabilities. We also concur with the participants that the availability of low interest loans should be explored. The women perceived the all female environment to be an asset, and expressed some desire for additional guidance and counseling

activities. They expressed some concern about the absence of a degree.

Chestnut Hill College

I. General Information

Site: Chestnut Hill College, Philadelphia, Pennsylvania
Project Director: Sr. Mary Kieran McElroy
Focus: Interdisciplinary - Biochemistry, Biology, Computer Science
Budget: $34,379
Expected Number of Participants: 25 - 30
Date of Visit: September 19-20, 1977
Evaluators: Dr. Charles Bertram, Ms. M. Joan Callanan, and Dr. Lafe R. Edmunds

II. Project Overview

Scientific Update for Women is an interdisciplinary project of 15 weeks duration designed to acquaint the participants with the new tneories and latest techniques in biology, chemistry, and computer science. The women were selected into three groups of ten each, and each group was assigned to one of the three four-week courses. They will rotate to other courses until each woman has spent four weeks each in biology, biochemistry, or computer science. Lectures and other prepared exercises are planned by faculty responsible for each of the three courses, and the women will be given some career orientation during the final two weeks. The project began September 13 and is scheduled to terminate on December 20, 1977.

Chestnut Hill College is a Catholic liberal arts college for women with an enrollment of approximately 650. The undergraduate student body is all women and mostly from the immediate geographical area. Some older persons of both sexes are enrolled in the continuing education program, which was begun five or six years ago. One major emphasis of the college appeared to be professional, and especially pre-medical, pre-dental, and other professional medical areas. Therefore, Chestnut Hill has a comparatively strong science department, and especially in chemistry, biology, and biochemistry. For example, 29 biology and 27 chemistry/biochemistry courses are listed in the college catalog.

III. On-Site Procedure

The information on which this evaluation report is based was obtained by several "on-site" procedures. The three evaluators arrived at Chestnut Hill at 2:00 p.m. and were given an orientation to the project by Sister Mary Kieran, its director. The team visited with the college president, and then the student dean.

Beginning at 3:30, the evaluators interviewed each of the three persons responsible for the courses for approximately thirty minutes each. Sister Eva Marie Lynch is teaching the biology courses, Sister

Ann Michael Joyce the computer science, and Sister Helen Burke is responsible for biochemistry. The evaluators observed the laboratories, the instrumentation and equipment, the computer terminal, the "kiddie corner" where the returning women may leave their children, and then had dinner with members of the Chestnut Hill staff.

Beginning at 9:00 a.m. the following morning, for approximately one hour, the evaluators interviewed the Directors of Career Placement, Continuing Education, Women in Management, and Cooperative Education, and then discussed the NSF project with 16 of the participating women in a group for another hour and a half. After having lunch with college staff, the evaluators examined the files of the 30 women who were accepted into the project and of the approximately 30 who were qualified but were placed on an alternate list because of space limitations. The evaluators briefly visited the classrooms and laboratories where the participants were "in class" before leaving Chestnut Hill at 2:30 p.m.

The evaluation report is therefore based on impressions resulting from staff and faculty interviews, inspection of equipment and facilities, student interviews, and examination of files. In addition, the evaluators studied the project proposal, course syllabuses prepared by the instructors, the college catalog, and other material descriptive of Chestnut Hill.

IV. Process Evaluation

Chestnut Hill College was founded in 1924 by the Sisters of St. Joseph, and rests on a three-century-old tradition of commitment to the education of women. The Sisters have been guided by the conviction that "on the education of women largely depends the future of society." As Sister Mary Kieran stated, the Sisters are the original "women's libbers"--they believe that women need to be trained for greater responsibility in society and gladly accept the women's need as their responsibility. If the project meets the expectations of the faculty, the chances of continuation are good as it clearly matches the institution's goals. One additional advantage for the college is that the project may encourage women to take existing biology, chemistry, and math courses through the continuing education program.

The most obvious reason why the project at Chestnut Hill will probably succeed is the faculty. They are well-trained, enthusiastic, and supportive of the project. Two of the three instructors and the director have received Ph.D.'s, and two of them very recently. The faculty/student ratio is unusually low (1:10), and several college staff are available to give advice in specialized areas, such as management science. The project participants were also positively impressed by the talent, organization, and enthusiasm of the faculty.

The equipment and facilities are adequate. The project will be conducted in various rooms, conference areas and laboratories of a charming five-story complex. The facilities are appropriate for the intended purpose; in fact, the compact campus promotes a feeling of concern for individuals.

The instrumentation, although not as sophisticated as that probably found in nearby industrial settings, can be used to give the women some experience with newer varieties of chemical, biochemical, and biological equipment. The computer facility is barely minimum. The one computer terminal may be used for some very basic instruction, but additional data processing facilities would be required for extensive student use or for more sophisticated application.

The library was not examined, but assumed to be adequate for this project. Additional reference works are available in faculty offices.

The three courses which are conducted simultaneously with groups of ten students are intended to give a sampling of material currently important to biology, biochemistry, and computer science. The content of the four three-hour lessons is based on a study of the participants' needs as expressed on their application forms, as well as a concern for what they are likely to experience in industrial situations. The courses are well organized into syllabuses, and lists of supplementary reading are provided.

The women were carefully selected into the three groups in a manner such that the groups would be heterogeneous with regard to age and experience of participants, and whether or not they are alumnae of Chestnut Hill. As far as possible, they are homogeneously grouped with regard to academic training and interest, and those with training in each of the three course areas were placed in those courses first. For example, those with training in biology began the Advanced Biological Techniques course first, since they would most likely experience less trauma in this course than in the courses in Biological Chemistry or Computer Science.

After three cycles of four-week courses have been completed, the women will participate in a career preparation day in order to find out how to go about a job search, and the final session will be devoted to demonstration of several role models by women successful in scientific enterprises.

The instructional delivery is primarily through lecture--discussion supplemented by laboratory and other "hands-on" experience. Much individual guidance and support will be given as desired by the women.

The publicity for the project was very effective. Most response came from advertisements placed in two regional newspapers, e.g., Philadelphia Inquirer. Ads were also placed in the alumnae publication, with radio stations, and with community newspapers. The popularity of the project is demonstrated by the fact that 61 completed applications were received for the 30 available positions. Examination of the files revealed that most of those who applied were well qualified for project participation, and the current participants volunteered that they had friends who were interested should the project be offered again.

The participants were selected through a two-stage screening process. The applications were first screened by the project director, who rejected those that were technically ineligible for reasons such as the lack of a science degree. The 57 acceptable applications were then rated independently by the three course instructors. No transcripts were requested, so the evaluation was largely subjective and based on a judgment of who was "most likely to benefit from the project." The rating was staggered by groups of 15 so that some groups were rated first by one instructor, and some by another. The 30 candidates with highest ratings were selected for the project, and the remaining 27 of those rated were sent a letter indicating they were alternates. None of the 30 selected turned down the offer to participate.

The proposed evaluation procedures are generally informal, as would seem appropriate to the project. The groups are small, and the instructors and staff will be aware of student progress on a week-by-week basis. No formal tests are planned. The participants will have an exit interview during their final week, to determine if they are "ready to go back" to approrpriate levels of employment and if they have a sense of adequacy. They will leave a second version of their resume which will be examined by project staff, and will complete a brief questionnaire on the final day.

As described previously, two of fifteen sessions will be devoted to participant counseling and placement. The women will be given guidance in resume preparation, interviewing, and other skills necessary for successfully seeking employment. They may, if they wish, participate in interviews during employer visitation day in the spring, and have their records on active file in the placement office.

The management of the project is exceptionally good. The evaluators have the impression that the project is planned in great detail, not only by the project director, but also by individual instructors and staff under her leadership. The style of management does not appear to be threatening, but rather, more collegial and participatory. All faculty and staff are quite excited about the project, which is an indication of effective leadership. The schedule has been adhered to, and present evidence indicates that the project will continue to be effectively managed.

Much of a general nature has already been said about the staff. Following is a more complete description of four individuals with whom the students will have considerable contact.

Sister Mary Kieran McElroy, the project director, is chairwoman of the Department and Professor of Chemistry. She received her Ph.D. from the University of Pennsylvania in 1964, has several publications, had a patent registered in the United States in 1968, and has participated in several NSF programs for science teachers. She is quite well organized, personable, and appears to have the respect of colleagues and students.

Sister Helen Marguerite Burke, the instructor in biochemistry, also received her Ph.D. from the University of Pennsylvania. She received her doctorate in 1976, and has had teaching fellowships at the University of Pennsylvania, Temple, and Bryn Mawr. She seems to be very perceptive of the problems which face married women as they attempt to enter the work force, and of women's emerging role in society.

Sister Eva Maria Lynch, who is teaching the biology course, received her Ph.D. from Institutum Divi Thomae in Columbus, Ohio in 1957 in Experimental Medicine and is now chairwoman of the Department of Biology. She has done graduate study and research at the University of Pennsylvania, Philadelphia College of Pharmacy and Science, Purdue, and American University, has articles in several referred journals, and has conducted some research at Chestnut Hill with in-house support.

Sister Ann Michael Joyce will teach the computer science course and is now assistant professor of mathematics at Chestnut Hill. She has her master's degree from the Catholic University of America, and has participated in NSF-supported projects at the University of Pennsylvania, Fordham, St. Lawrence, Villanova, and St. Peter's College. All four of the Sisters are Chestnut Hill alumnae

These four Sisters will carry the instructional load, and others described in the proposal and elsewhere will help with counseling, supplying career information, and assisting with job placement. As stated previously, the faculty and staff are well qualified to give academic instruction to the participants, are excited about the program, and have the respect of their new older students.

Twenty-five of the 30 women selected as participants had received their degrees from two to fifteen years ago. Five had received their degrees earlier than 15 years ago, but they were accepted because they were judged by the Chestnut Hill faculty to be in a position to gain more from the orientation than more recent graduates. Nineteen of the participants are alumnae of Chestnut Hill.

The women are all married, most if not all have children, and some have as many as five. Many of their children are quite young; in fact, one woman had given birth about two weeks prior to the second class which the evaluators observed. She was present in the class. Most are from the Philadelphia area, but six are from New Jersey, one from Delaware, and one from Texas (and staying with a relative in the local area).

All the women expressed interest in employment and a few had been actively seeking jobs. About 80 percent have previous work experience, and some are currently employed on a part-time basis. Some of them said they felt the "world is passing them by" and that they "need confidence in myself." They are interested in becoming acquainted with the instrumentation, and appreciate the opportunity to be "eased" into the academic and employment worlds. They appreciate the opportunity to attend the classes during the daytime and on one day a week, and are pleased with the work the Sisters have done at Chestnut Hill. Several said the program is "ideal" for their purposes.

V. Outcome Evaluation

At the time of the evaluative review on September 19-20, the students had been in only one class meeting. Therefore, very few evaluative judgments of a summative nature can be included in this report. Instead, the evaluators wish to emphasize the unique aspects of the Chestnut Hill project which may bear further study to determine if they lead to a more effective NSF Women in Science Program.

As indicated previously, the women were quite excited about the project. Over half of the group interviewed indicated that they would have paid a small tuition fee for the opportunity to participate in it. They wanted to clarify their career goals through involvement in the project, and rediscover the world that was passing them by. The course is not designed to lead to a large gain in knowledge, but rather represents a small sampling of knowledge from three areas so that the women can get an idea of the current state of knowledge in these areas. Since there was an unusually long planning phase, the project may have already had some impact on the faculty. They have had to think of the real-life needs of mature women, and about what the programs at Chestnut Hill might have to offer them. Several of the faculty and staff will probably become more sensitive as the semester progresses. For the most part, the project has not yet had much effect on the total college or surrounding institutions, but the potential is there, especially since there are so many bio-chemical and chemical industrial complexes near Chestnut Hill anxious to employ women and work them into managerial positions.

One unique aspect of the Scientific Update for Women project is the lengthy planning phase of approximately one year. There are some very good reasons why the project was not planned to start until September, and the time was well used by Sister Mary Kieran and colleagues for very detailed and systematic planning. Further summative evaluation by NSF (or the college) might examine the effect of the long planning period on project outcomes.

Another unique aspect is the relatively small amount of course work. The participants will have 36 hours of formal classwork during the semester. This may or may not be sufficient and should be studied since it has important economic implications for future projects to be developed by NSF.

An attractive feature of the project for the participants is the fact that they need spend only part of one day a week on campus. Many, in fact, could probably not participate if more time on campus were required. However, several indicated during our interview session that they could devote more time to the project.

One additional interesting facet of the project is a proposed process for teaching the women to effectively participate in interviews. They will be videotaped during their own simulated interview, and then will critique their interview with the assistance of staff. The procedure would appear to have possibilities, and might be studied with the idea of broader dissemination if effective.

VI. Summary Reactions

The most positive aspect of the Chestnut Hill project was the determination, talent, and resourcefulness of the faculty and staff. They are highly qualified for what they are doing, and are genuinely interested in helping the women. The evaluators are not in a position to dwell on negative aspects, since statements so early in the project life would be unfair. The dearth of computer facilities would appear to strain the imagination and resourcefulness of the instructor, but the women do not intend to become programmers as a result of their experience.

One possible outcome not intended as a part of the project is that the women may wish to come back to Chestnut Hill and take courses suitable to their ability and interest through the continuing education program. However, some felt that the women should try to obtain employment in industrial settings, and then take advanced work as inservice, at the expense of employing industries.

The overall reaction to the project was very positive. It was well planned, is being implemented efficiently, and has a high probability of achieving the objectives stated in the proposal to NSF.

VII. Recommendations

Few changes in the conduct of the project were suggested. In view of the many developments in biology, biochemistry, biomathematics, etc., in recent years, Chestnut Hill might wish to consider offering an optional seminar on interdisciplinary research that would help illustrate the linkages between the three areas in which course work is being offered. This would involve some outside reading on the part of those taking the seminar but need not involve exams or term papers. One or two seminar meetings of this type might be held on an experimental basis with this group of participants to determine the feasibility of including such a component if the program is offered again.

If the project is repeated, the faculty might wish to consider personal or telephone interviews of final candidates as one screening procedure, since there was little information on some application forms. The participants might wish to consider a site visit to some local industries if additional time could be found.

One additional suggestion was that a "post-test" version of certain questions on the application form be used near the end of the course. Replies to these questions might be examined to determine changes in career goals, felt need for scientific updating, what they gained from the course, and any increases or decreases in career goal specificity.

During their interview, the participants gave some suggestions which NSF might want to consider with Women in Science programs. They thought NSF might work out some type of "trainee" program, whereby industry would be supported for employing and training women for specified positions. Industry should be encouraged to permit mothers to work a 9:00 a.m. to 3:00 p.m. day, and job-sharing by two women should be considered.

The evaluators have few recommendations for NSF, other than those already mentioned in the report. Certain unique aspects of the Chestnut Hill program should be carefully studies, so that recommendations can be made for future programs. The area represents an important social need, and documentation of effective variations can lead to needed social change in a cost effective manner.

University of Dayton

I. General Information

Site: University of Dayton, Dayton, Ohio
Project Director: Dr. Carol Shaw
Focus: Engineering
Budget: $111,944
Expected Number of Participants: 30 - 40
Date of Visit: August 1-2, 1977
Evaluators: Esther Lee Burks, M. Joan Callanan

II. Project Overview

The project is designed to (a) bring women with a bachelor's degree in chemistry, physics, or chemical technology to the equivalent academic level as current Chemical Engineering graduates; and, (b) to bring women with a bachelor's degree in physics, mathematics, or electronics engineering to the level of current graduates in electrical engineering. A further goal is that women in the program will be qualified for entrance to a Master's degree program in the appropriate area. Engineering employment is also a goal, for those students who have not been employed recently in career-track positions.

The project began in July 1976, and will run through December 1977. Participants receive instruction in chemical or electrical engineering courses, along with remedial mathematics at the level of differential equations. In addition, the program provides career counseling, career development courses, job search assistance, tutoring, study skills assistance, and personal counseling. The group consists of two sub-groups--chemical and electrical--who share a common core of appropriate courses, and who are moving through the two programs at about the same rate.

The University of Dayton is a private, Catholic institution, located on a spacious campus in the city of Dayton, Ohio. Overall size of the student body is approximately 11,000. Undergraduate engineering programs involve 525 students in four E. C. P. D.-accredited (Engineer's Council for Professional Development) programs (Chemical, Civil, Electrical, and Mechanical). Graduate engineering programs are offered in seven areas, and involve 300 students. A Dual Degree program, involving 50 students, is in effect with Wilberforce University. This program allows students to attend a liberal arts college for three years, and an engineering school for two, and receive two degrees--one from each program--at the end of five years. A "Late Entry" Bachelor's in Engineering is offered by U. of Dayton at night and on Saturday to persons without a degree, who are employed in an engineering environment. Seventy percent of students at the institution receive some form of financial aid.

III. On-Site Procedure.

The site visit schedule comprised two days of interviews with staff and participants, visits to project activities, and inspection of facilities and project records. Staff interviews included interaction with the following: Carol Shaw, Project Director; Nancy Cook Cherry, Psychological Consultant; Dr. Bernhard Schmidt, and Dr. Ronald Servais, from the electrical and chemical engineering faculty; three other faculty members involved in teaching project courses; Brother Joseph Stander, Vice President for Academic Affairs and Provost; and Dr. Herman Torge, Project Evaluator. The site visitors were escorted through the majority of areas used by students, and visited chemical and electrical engineering classes. In addition, the team spent about five hours meeting with students in the program, both as a group and individually. All student records and correspondence were made available.

IV. Process Evaluation

In this section, the discussion is addressed to two primary issues--the integration of the project into current activities at the university, and the degree to which the program has been carried out according to its proposed plan. The first of these--institutional responsiveness--is the factor most relevant to the likelihood for continuation of the project in the absence of N.S.F. funding.

Integration into ongoing programs is a strong point at U. of Dayton. The program is similar to others run by the institution, such as its "Late Entry" Bachelor of Engineering, and its retraining program for chemists at Monsanto. The Electrical and Chemical Engineering Departments support the program strongly, but Mechanical Engineering chose not to participate. In an effort to provide a supportive environment for project participants, the group has been effectively removed from the normal administrative procedures students must cope with, as well as from other students in the same academic programs. Students do not register with others, for instance, and have little contact with fellow students, since virtually all class experience is within-project. They have been given greater than normal help with outside-project problems such as housing and part-time job search. The school has an active Women in Engineering Program, so that these "exceptions" are not as far from normal practice as they might be at an institution without them. On the whole, incorporation into existing procedures is considerable.

The degree of incorporation into existing procedures is due, primarily, to the apparent match between normal university policy and project objectives. The commitment by the University to other programs for students with special needs due to age or previous experiences is evidence for this. The result is that faculty prominent in the school are heavily involved in the project; quality of the students in the program is high; and, at the half-way point, there

seems a strong possibility for a majority of the students who entered finishing the program. Physical facilities for the program are excellent, both from the standpoint of availability to students and overall maintenance. Most are centrally located, and the students have free use for study and group activities of a large area in the same building as classrooms.

In the following material is presented a description of the project as it is being carried out, with respect to its educational, non-educational, and management aspects. The educational component of the program has included substantial technical material (30 semester hours for each sub-group), and a considerable amount of motivational and diagnostic activity. These latter activities have included monthly meetings on topics relating to personal effectiveness, such as study skills and ways out of depression, and a one-week program for motivation and needs assessment presented at the beginning of the program. Fall activities will include a "Job Fair" in which employers of chemical and electrical engineers will spend two intensive days on campus presenting career information and interviewing students in the program for permanent jobs, and a career education course (for one hour credit) designed to increase self-presentation and decision-making skills.

The content of the academic portion for the two tracks apparently reflects the experience in continuing education and the considered judgment of senior faculty regarding the irreducible core of the two programs. Course content is documented in Preliminary Report Two, from U. of Dayton to the Foundation. Courses include several newly-developed for this program, as well as several used in other programs for non-traditional students.

Several means of instructional delivery are used in the project. The chemical engineering track students are exposed primarily to standard lecture methods; while the electrical engineering program students are using primarily modular, self-paced units. Both groups, however, have some experience with both modes. The academic portion of the program has been consistently scheduled for the morning, so that those who wish may work on a part-time basis. Project participants are, for the most part, isolated from other students in their areas.

Publicity for the program included direct mailings of a detailed brochure to lists of alumni with appropriate degrees from 74 mid-west universities, mailings to 1561 employers of technical personnel, and articles sent to technical journals and newsletters, the public press, and television. Over 18,000 brochures were distributed. The brochure for the program presents complete information about the program in an attractive and easy-to-read format. Lag time

in obtaining mailing lists from colleges created problems, in that several participants were accepted as late as December. The lag also resulted in some persons who were interested in the program not applying, due to prior commitments (teaching contracts, for example) that earlier recruitment programs might have prevented. The recruiting effort, supplemented by intensive telephone and personal interviewing with undecided candidates, resulted in a group of 31 participants--13 in the chemical track, and 18 in the electrical.

Participant selection procedures are a strong point in the project. The final selection of applicants was made by a review committee consisting of the chairmen of the chemical and electrical engineering departments, and the project director. Each committee member individually assessed the applicants, using a rating scheme, with respect to several aspects of the candidates. These ratings were combined; disagreements in rankings among the individual committee members were discussed, and a final selection was made.

Evaluation procedures include both formative and summative (end of program) activities. Dr. Torge, in coordination with Professor Shaw, has implemented these procedures. The evaluation effort includes monitoring of the students' academic progress by means of grades in the courses taught, monitoring of the students' perceptions of the program through the administration of project-developed questionnaire measures, and in-depth interviews with the students at the half-way point. Curriculum content, counseling procedures, and project activities have shown adaptability to students' needs, as determined by these formative evaluation procedures. For example, when it was determined that virtually all students wished to earn a second degree, the courses offered were modified so as to make this possible within the context of the program. Summative evaluation is, however, not yet set. There is a reluctance to use a post-text, such as the G. R. E. or the E. I. T. to compare this group of students with a control group of current seniors. Some consideration is being given to an item analysis of performance on quiz questions given to both this group and current seniors.

Participant counseling on a formal and informal basis appears to be a continuing process. The time lag for receipt of mailing lists described above resulted in several participants coming to the program with little preparation, with respect to means of support or place to live. The project director accepted, in some cases, the major responsibility for these aspects. In addition, the University has supplemented the project-offered funds for courses with scholarships of varying amounts to three participants. Cooperation with local employers, especially Wright-Patterson Air Force Base, has resulted in placement of several students in part-time jobs. The portion of counseling and placement anticipated in the

proposal included the initial motivational and diagnostic week, a career education course planned for the fall, the Job Fair described above, and use of the University's placement service.

The management of the project has resulted in clear delineation of responsibilities and virtually exact adherance to the schedule proposed in the application for funds. Academic decisions are made by the faculty in the electrical and chemical engineering departments; evaluation procedures are directed by Professor Shaw and Dr. Torge, from the School of Education at the university; and career counseling and placement are the responsibility of Ms. Cherry and Professor Shaw. Frequent meetings of project staff have been used to keep the project on target, and encourage good communication among the leaders of the various elements. Other university resources, such as the placement office, are also involved in the project where appropriate. Interviews with a wide variety of officials indicate a high degree of enthusiasm for the project, its participants, and the quality of its direction.

Examination of student records indicates that the group is well-prepared and of high quality academically. Of the 13 original chemical track students, 6 have M.S. degrees, 6 have prior teaching experience, and 10 have had experience in a science-related job. Two are Afro-American. The mean age is 32 years, the modal age is 25, and the range from 24 to 47 years. The 18 original electrical track students are, on the whole, younger than the chemical track. Four of this group had M.S. degrees, six have prior teaching experience, and two-thirds have been employed in a technical job. The mean and model age is 25 years, with a range of 23 to 30 years. Many of this group have training in computer programming. 12 of the participants are currently married, and seven have children at home. Four of the twelve are separated from their husbands. Fifteen of the original group came from Ohio; the remainder from New Mexico, Indiana, Missouri, Michigan, Maryland, Pennsylvania, Illinois, Oregon, and Massachusetts. Four of the original group of 31 have left the program--one to take a good job opportunity, and three to be with children (one of these had, unknown to project management, a three-week-old baby). The four who left were all from Dayton, and were all in the chemical track.

In group and individual interviews, the students expressed complaints including the following: some thought they were promised part-time jobs, which had not materialized; some felt the jobs that had been found were make-work housing was considered low in quality and too expensive; and many felt that the goal of the program should be a degree.

In contrast to the above comments, expressed by three or four individuals, are the following positive comments: the program encourages older women who might otherwise not have courage for this type effort; project has supportive, accessible professors who encourage questions; the short semesters and immersion techniques used are an advantage in learning new material; the large study room is a help; the career planning aid is very strong; and, in general, there are "a great many extras" in the program.

All students in the group were present for class on the day we visited. The classroom atmosphere was attentive. Attendance at the dinner and student meeting the night before was high, as well. All students expressed the determination to earn a second B.S., using the 30 hours offered in the program (an institutional requirement for the second B.S.) as base. On the whole, the group seemed very enthusiastic about the program and about their own potential as a result of it.

V. Outcome Evaluation

The participants' reaction to the project is very favorable, with the exceptions noted above. It should be noted, as well, that many of the students' objections stem from the short lead time for deciding to participate in the program, which caused problems with respect to housing and part-time job support. The participants, as a group, seem to lack clear career goals, a not-unexpected result, considering their sudden change to a new field. They can be expected to gain in this area as a result of their fall experiences in the Job Fair and the career education course. Academic performance has been good for this group. Grades for courses taken up to now are quite high--A's and B's, for the most part. Three of the students have taken the regular course in Physical Chemistry and received the three top grades (of seven).

Faculty perceptions of the program seem very positive. The five with whom we spoke all expressed the conviction that this group of students is exceedingly well-qualified. Indeed, the comment was made that many of the women were qualified for graduate school without benefit of the program, but seemed to be unaware of this fact due to lack of confidence.

The institution has, as a result of the program, reduced the number of credit hours at U. of Dayton, required for a second degree, from 45 to 30, the number offered in the project. Courses developed for this project will find use in other programs at the university; these have been documented as to objectives, content, and are ready for other use.

Continuation of the "Fast-Track" for women has not yet been seriously considered, so far as alternate sources of funding are concerned. Faculty are already considering incentives for attracting participants, however, and are considering making the program a degree-granting one, if it is run again. There seems to be excellent potential for continuation, even in the absence of N.S.F. funds. The institution has a strong women-in-engineering program. It has, in general, a willingness and flexibility to meet student needs, as evidenced by the "Late Entry" program described above, and its "Metro-Center" program for students over 22 years of age, who wish to attain a college degree. These programs are designed to meet the needs of the non-traditional student as well as to meet institutional needs for growth and change. It is this dual match of student and institutional needs that offers the promise of continuation of this program for mature women.

An obvious impact of the program outside the university is on employers in the Dayton area. Many of the students are employed part-time in engineering-type jobs. It should not be overlooked that the first women in such jobs have the potential for quite a favorable impact on the progress of Affirmative Action programs. That is, when women as well-qualified as this group enter a job formerly held only by men, and perform well, the task of women who follow is made much easier. The high quality of this group should mean that such an effect may be a result of their part-time employment during the program.

VI. Summary Reactions

The major positive aspects of the project include the following: clearly-stated goals, education in career areas in which employment demand is strong, excellent physical facilities, a philosophical integration with other ongoing programs at this university, staffing which includes influential members of the academic community at the university, timely and flexible execution of proposed program components, a strong career-education component, and excellent student selection procedures.

Problems in the pgoram are relatively minor, and, for the most part, seem to stem from the short time allowed by the grant process for publicity and recruitment. There is a tendency to over-use the questionnaire technique, and to depend on statistical analyses of such instruments to detect changes that such procedures (for reasons discussed in the next section) are not sensitive enough to measure.

Outcomes other than those intended include the determination of a majority of participants to earn a second undergraduate degree, and of many participants to take the E. I. T. exam. The reduction of institutional requirements for the granting of the second undergraduate degree is another side effect of the program.

Our reaction to the project is very favorable, for reasons detailed above. The program offered seems an excellent opportunity for women who have previously lacked a career impetus; and we believe it should result in their placement in career-track positions, or in graduate school, at its completion.

VII. Recommendations

For the visited project, we offer the following recommendations, particularly in light of the potential for a second project.

1. In a second project, either: at least nine months to a year be allowed for publicity and selection, with the understanding being that part-time work and housing arrangements are the responsibility of participants, just as they are for other students, or, sufficient funds should be allowed in the project budget for assistance in these areas. Timing of recruitment should be such that what appears to be a major market for such programs--the high school science or math teacher--can be reached.

2. It would be desirable for students in the project to have the opportunity for interaction with other students in their disciplines. One of the important skills in a job setting is the ability to work as a team member with other professionals. For the woman who is late beginning a career, it is important to learn to relate to individuals who may be younger than she, but who are, nevertheless, on the same level as she. This process begins in the academic setting, so that complete isolation of students from others is some handicap in the preparation for future working experience.

3. Overuse of the questionnaire method has some drawbacks that should be considered. For one thing, the group is small enough to be treated as individuals, and the obscuring effect of analysis of means is a barrier to effective communication. There is some indication that students resent such frequent surveying, as well. Beyond this public relations aspect, is the fact that the assumptions underlying the use of statistical analysis of this data are not met, in such a small group, so highly self-selected. Thus the validity of any such analyses is open to serious question. Much use has been made of an instrument entitled "Stress Test". The lack of sensitivity and violation of statistical assumptions means that little or no useful information can be gained from this unvalidated measure. There exist validated instruments for the measurement of both situation-specific stress, and general anxiety; but it is not clear why such analysis is appropriate in this project. No provisions for psychiatric counseling are made, nor are expected to be. If what is wanted is, rather, an assessment of how students are reacting to the program, for purposes of modification and improvement, then the most effective means is to ask them, in semi-structured interviews and through informal means.

4. There exists an apparent reluctance to measure the primary outcome variable defined in the proposal--the academic equivalence of women who complete the program to current graduates in electrical and chemical engineering. To do so seems quite important, since it is just this type of objective evidence that could be used to convince industry of the value of graduates from this type program, whether conducted for women or for others who wish to change career directions. A test for which national norms exist would be the best alternative, or, failing that, a test that both these individuals and current seniors at U. of Dayton could take. The. E. I. T. exam is a possibility; even though some areas covered in it are not studied (or needed) by this group. Scores can be compared overall, and without that class of scores which represent material unknown to these women (areas selected before testing, of course). The G. R. E. is also a possibility, if engineering scales exist. Least desirable is item analysis of tests given these women, compared to current Dayton students. The possibilities for bias in the latter make such a procedure essentially useless. I strongly recommend that a decision be made to do the appropriate testing. The care with which the curriculum in the project has been defined, and the quality of the students and the project execution, mean that rather convincing evidence for the value of these type programs may be forthcoming. And, of course, failing that, useful information for purposes of modifying other years' efforts would certainly surface.

Recommendation for the Women in Science program generally have been detailed in the report on the New York Polytechnic project. In addition to those, we would add the recommendation that future N.S.F. programs build in a strong career education and job search skills learning component. It seems clear that for women in these age brackets, with spotty job histories, the career facilitation component is of great value in allowing the academic preparation and promise to be realized.

I. General Information

Site: George Mason University
Project Director: Dr. Natalia Meshkov
Focus: Energy-related Physics
Budget: $65,872
Expected Number of Participants: 25-30
Date of Visit: June 8, 1977
Evaluators: Frances, Lawrenz, Conrad Katzenmeyer and M. Joan Callanan

II. Project Overview

The project at George Mason University provides a basic review of undergraduate physics with a special emphasis on relating physics to energy problems. Project participants are integrated in the regular academic program to a considerable extent - many of the students have concurrently enrolled in other courses.

The project is a two-semester sequence (Winter and Fall, 1977) with the summer period designed for special projects and completion of the previous semester's work. Specific project instructional activities include an individualized (Keller plan) review course with a 1 hour per week lab, and a 2 semester graduate course dealing with energy problems. Additional courses are obtained from regular offerings. The project also includes weekly seminars alternating invited lectures on energy topics with counseling-discussion sessions. A total of 24 students have participated, either full or part-time and during the day or evening.

George Mason University is a public institution located in Fairfax, Virginia, a suburb of Washington, D.C. It has a student body of 9000 enrolled in undergraduate and Master's degree programs. Its enrollment has increased markedly in the past 10 years and it continues to grow. Approximately 1/3 of the students are older than the traditional college student. The Physics Department currently offers both a BA and a BS degree in physics. It has a staff of 10, 8 full time and 2 part time. In addition to providing service courses for other disciplines at the University, the Department has 36 students majoring in physics.

III. On-site Procedure

The three of us spent a full day on the George Mason campus. We met with the Project Director, the Physics Department Chairman and several members of that Department, sixteen participants (both day and evening students) and the Associate Vice-President for Academic Affairs. All interviews and discussions were conducted with all three of us attending. In addition, we toured the physics laboratories and reviewed file materials on applicants and internships.

We did not observe any instruction as there are no organized group activities during the summer.

IV. Process Evaluation

George Mason University has been very responsive to the Career Facilitation Project. The project goals of retraining or updating women's science skills provide a focus for George Mason's intense interest in continuing education. This interest essentially paved the way for the facilitation project. In order to encourage continuing education, the University has already established administrative procedures for handling students who are not yet committed to a specific program or who are admitted in a non-traditional fashion. Therefore, the women in this project could matriculate easily. In addition, the University facilitated the introduction, approval and incorporation into the catelogue of the project courses, easing any enrollment problems of the women in the project and allowing them to obtain academic credit for project courses as well as regular University offerings. With this emphasis on continuing education, the student body consists of many older working students and the project women fit in well. They are not singled out as belonging to a unique group except in their project courses. Continuation of the program would be easy (and pleasing to George Mason) from an institutional standpoint if the women could handle the cost of tuition.

The project is also supported strongly by the Physics Department. They are pleased to have more students in the Department and to have the chance to develop and offer new courses. The Department Chairman is enthusiastic and cooperated as much as possible in providing ideal scheduling and staffing. However, due to a University-wide space problem, the only space available to the women aside from general student facilities is Dr. Meshkov's small office.

The educational program is sound. The students use various learning methods, i.e., individual self-instruction, laboratory, tutorials, lectures and seminars. The content of the project courses appeared valid and relevant although there was not as much emphasis on energy-related physics in the first semester as expected. The women received a general review of physics through the Keller plan and laboratory, a class on Physics of Environmental and Technology, alternating weekly seminars on energy-related physics and psychological/job procurement training, and specific instruction in other areas by selecting additional courses, e.g., economics, mathematics. At the time of the visit there was no evidence of individual, summer research projects although one participant had arranged to spend some time working with a relative on a problem related to air conditioning.

One procedural difficulty with the educational program is that since George Mason has no graduate program in physics the women can not take graduate physics electives nor can they apply their earned credits toward a graduate degree in physics. If they want to continue their education after completing the project they will have to either continue in physics at another school or switch to another major, e.g., mathematics at George Mason.

The participants were generally pleased with the educational program but the following comments may provide an indication of possible areas for modification or improvement of the project. Many participants felt that the Keller plan began at too high a level and they would have liked more basic review first, perhaps in a cohesive classroom lecture situation at the start of the program. It is also taking much longer for the women to complete the Keller plan review than expected. However, these difficulties may be because many of the women do not have strong physics backgrounds. The physics laboratory experiments were not integrated with the Keller physics review and the students were not convinced of their value to the instructional program. There were conflicting reports on the usefulness of the psychological/job procurement sessions but in general they seemed to provide support for those women who needed it. Those who felt they didn't need hlep just didn't attend. In general, the physics seminar series was well received but they were perhaps aimed a bit too high - the women mentioned feeling lost. There was some difficulty with scheduling. The women felt that the lab and courses should have been arranged so that they could attend the maximum number of things in one day, e.g., schedule lab immediately before the environmental class.

The project is administered well, and is running smoothly. Dr. Meshkov did a good job of providing publicity for the program and in selecting participants. The publicity phase was carried out during the first three months of the project. A program announcement appeared in the Washington Post and in the Association for Women in Science Newsletter; there was a brief T.V. appearance and four thousand brochures and one hundred posters were distributed. The applicants were selected by a three member committee using the applicant's potential to successfully complete the program as the main selection criterion. Several participants do not have a physics background but this was due to a lack of physics applicants not faulty selection.

The majority of the responsibilities for administering the project, teaching, counseling and evaluation were handled by Dr. Meshkov. However, Physics of environment and Technology course and the non-physics courses were taught by other instructors. Although there was no specific formalized plan for formative evaluation, Dr. Meshkov was very responsive to and communicative with the students and was therefore aware of any problems or difficulties in the program. She often talked with the participants and held a general gripe session after the first semester of classes.

The project has at least another 7 months before job placement becomes a real issue but Dr. Meshkov has already placed one student in a part-time position and made contacts with several industries who would be prospective employers. Apparently, placement will not be a problem.

The project director is Dr. Natalia Meshkov. Her background is in theoretical nuclear physics and she is actively involved in several groups concerned about women in science. The project was Dr. Meshkov's full time assignment and she is very involved with it. She is interested and concerned about the participants on a personal level. In fact, one of the participants and her child were living with Dr. Meshkov until this summer. She is responsive to the participants and makes every effort to continually restructure or modify the project to fit their needs. She spent a good deal of time and effort working through University channels to get her project courses approved for credit and to facilitate participant enrollment in other courses. She appears to be a very dynamic person who is enthusiastic about the program and its potential.

The project staff consisted mainly of two other people, Jane Flinn and Bill Lankford. Dr. Flinn made a unique contribution to the project because of her unusual educational background: she holds doctoral degrees in both physics and psychology. She, along with several guest speakers, ran group sessions every other week. She seemed to provide a good contrast to Dr. Meshkov in that her concern for the participants was more detached and objective. This allowed the participants to have discussions in an interested but more neutral atmosphere without any pressure. Those participants that attended the sessions found them useful. The least liked session was one on assertiveness training while the favorite ones were on locating jobs. Both of these topics were handled by guest speakers.

The other project staff member was Dr. Lankford who is an experimental nuclear physicist with an interest in environmental physics. He developed and taught the Physics of Energy and Environmental Technology course. He mentioned that it was difficult to prepare adequately for this course given his already heavy instructional load. However, he did enjoy the class and was impressed by the motivation of the participants. He was flexible in the course presentation and was willing to go back over basic areas if the women couldn't follow his proposed content. He also was personally interested and concerned about improving the balance of women in the sciences.

Other persons involved with the project were the seminar presenters and other college staff. The presenters were external experts who did presentations of physics or psychological topics on alternating weeks. In general the participants appeared to find the sessions valuable. An additional outcome was the benefit obtained by the University staff from attending the physics seminars. Other staff helped Dr. Meshkov arrange seminars, plan laboratory experiments, and complete administrative and clerical work.

Thirty-five participants were selected from 49 applicants. There were three declinations, 2 withdraws, and 2 dropouts, leaving a total of 24 participants. Seven participants had degrees in physics, eight in mathematics, seven in chemistry, two in biology, and four in other natural sciences. The dates of their degrees ranged from 1951 to 1974 with the mode being 1969-71 (in keeping with the post-war baby boom). Most of the participants are committed to employment and are self-confident. They see the project as a cost-effective way of getting themselves back into the job market. They appeared to work hard and are enthusiastic about the program, both for employment opportunities and because they were personally concerned about energy usage. Many of the women were not primarily physicists and as such were compelled to learn a good deal which may or may not be useful in future careers. For instance, a background in energy-related physics may not be useful for someone in graduate school mathematics. They are inclined to be selective about what project activities they attend and if they felt a particular activity was not useful they would not attend, e.g., laboratory.

V. Outcome Evaluation

The participants reacted well to the project. The drawing cards in oder were: 1. the free tuition; 2. the potential emphasis on job placement; 3. the group "espirit de corps"; and 4. the active recruitment (feeling especially selected). The women appeared to gain a good deal of knowledge about physics and the other topics they selected but there was no specific job-related training. The women seem anxious to enter the job market or to continue graduate work. Although the project enhanced their self-images, the participants were fairly self-confident of their ability before the project began. They found the course work interesting and challenging. One shortcoming with the extra selected topics courses was that while the biology and mathematics departments were actively cooperative, the chemistry department dragged its feet. This made it hard on the chemists in the group. Interestingly, two of the women in this project transferred to the American University program which is in chemistry. Another difficulty was that since many courses are sequential, starting in the Spring semester limited the number of regular courses the participants could take. In summary, however, the participants were positive about the project as a whole and would recommend the program to others.

The physics faculty are pleased with the students and with the addition of new courses to their department repertoire. The project helped bolster the department by demonstrating new avenues for increasing enrollments and in general providing a breath of fresh air. Also, the faculty found the seminars personally interesting and beneficial.

The project is also affecting the University. Naturally the project provided the institution with a good deal of valuable publicity. This should help increase enrollments even more than the actual increase caused by the participants. Since the state funding allotments are based on enrollment figures, the University may even gain financially as a result of the project.

VI. Summary of Reactions

In general the project appears very healthy and is running well. In our opinion, the strongest aspect of the project is its integration into the regular University program. The procedure allows the women to take additional courses in areas they are interested in but still provides a common basis from which to develop supportive relationships. In addition, the women are able to compare themselves with other students not in their unique situation and gain self-confidence through the experience. Employers are familiar with categorizing academically accredited courses and this may facilitate employment. Finally, the project director and staff are enthusiastic about the program and very responsive to the participant's needs.

The negative aspect of the project is the lack of specific job skill training in the first semester, especially as many of the women were not and will not be in physics. The course work was interesting to the students but seemed somewhat at cross purposes because of their backgrounds. Also, the energy emphasis was not strong in the first semester.

VII. Recommendations

The project seems to require few if any changes. The participants and staff are enthusiastic and positive. The course work is appropriate and the women are job-oriented and self-confident. Some changes we suggest include making the laboratory integrated with the physics review, providing more basic background material before having the participants begin the Keller plan, ensuring the proper level of difficulty for the physics seminar presentations, improving scheduling, and encouraging summer research projects.

Because the women were so effectively integrated into the general George Mason University environment, one possibility for NSF program modification would be to merely provide tuition to selected women to return to school, allowing them to select various courses themselves. This would avoid the difficulties encountered by the women of various backgrounds in this program. One problem with providing tuition only would be the lack of the psychological support provided by the group. While it is likely that there would be some overlap in the courses selected by the

women and therefore some peer contact, the problem could be better solved by providing a liaison person who would help with recruitment and registration and be available to discuss problems. In addition group meeting space for the women pursuing various disciplines could be provided. Another problem with the tuition approach would be the lack of opportunity for review of basic subjects. This might be handled through intensive review courses in the summer before enrollment in regular classes.

UNIVERSITY OF LOWELL

I. General Information

Site: University of Lowell, Lowell, Massachusetts
Project Directors: Dr. Rita Blattberg Blumstein & Dr. Joseph Salamone
Focus: Polymer Chemistry
Budget: $27,739
Expected Number of Participants: 10
Date of Visit: June 21-22, 1977
Evaluators: Evelyn Brzezinski, Frances Lawrenz

II. Project Overview

The purpose of the Career Facilitation Project at the University of Lowell is to introduce women who possess the B.S. or M.S. in chemistry or chemical engineering to the field of polymer science. Introduction to the polymer science curriculum is based on coursework and experimental training in the polymer laboratory. It is expected that upon completion of the NSF training program, participants will be able to find employment in the polymer field or to enter a graduate polymer program.

The project is a four hours a day/two days a week, year-long program, with the summer months devoted to optional individual research activities and/or additional laboratory experience. During the regular academic year, Tuesdays are devoted to laboratory activities and Thursdays are devoted to lectures by faculty in the regular polymer science program. Although billed as a four hour day, the labs are available all day Tuesday and Thursday so that the women may spend extra time there. Most of the women do spend full days on campus Tuesdays and Thursdays.

The University of Lowell was officially created in July 1975 from the merger of two state-sponsored institutions, Lowell Technological Institute and Lowell State College. As a result of the merger, the previously separate technical and liberal arts programs of each institution were joined into a University system. Present enrollment is 5923 fulltime undergraduates, 2946 evening school students, 267 fulltime graduate students and 1010 part-time graduate students. Doctoral degrees are offered by the Departments of Chemistry and Physics.

The Department of Chemistry offers the following degrees:

B.S. (with and without American Chemical Society certification)
B.A. (with and without ACS certification)
M.S. in Chemistry
M.S. in Polymer Chemistry
Ph.D. in Chemistry
Ph.D. in Chemistry - Polymer Science Option

In the annual report for 1975-76, the Chemistry Department chairman notes there were 79 undergraduate students (including 17 who received their degree--placing them second among New England colleges and in the top 10% nationally in the number of ACS graduates), 42 master's degree students (including 7 who received their degree) and 14 Ph.D. students (3 who received their degree) during that school year.

The number of graduate faculty in the chemistry department is 22, of whom 7 are listed as faculty in polymer science research. The faculty of the polymer science program is recognized nationally and internationally for their research efforts. Several of them are active in the Division of Polymer Chemistry of the American Chemical Society and also serve on the advisory boards of journals in the polymer field. Because of the accomplishment of the Polymer Science Program of the Department of Chemistry, the University of Lowell has targeted this as an area for future growth and development, according to the initial proposal for funding in the Career Facilitation Program.

Although the project officially has a co-directorship, Dr. Blumstein is the major contributor. In the following sections, discussions of the project director's activities refer to Dr. Blumstein.

III. On-Site Procedures

The two evaluators spent from approximately noon on June 21 until 4:00 on June 22 visiting the University of Lowell program. The first day of the visit was spent talking with the project director and Chemistry Department chairman and reviewing files related to the project and its participants. The following people were interviewed on the second day: all nine of the participants, another member of the polymer science faculty, the laboratory instructor, the Ph.D. student who provided tutorials for some of the participants, the Dean of the College of Pure and Applied Science, the Dean of the Graduate School and the Assistant Dean for Continuing Education. We also toured the laboratory facilities on the second day of our visit.

IV. Process Evaluation

In terms of content, the women in the NSF project are not getting anything radically different from regular first year master's degree students in the polymer chemistry program (with the exception of some review of undergraduate organic and physical chemistry). Thus, incorporation of the program into existing department and college procedures would be relatively easy. Department and college administrators seem very supportive of the concept of recruiting women who have a science background back into advanced training programs, and there is every indication that such support will exist after NSF funding.

The project represents a new effort on the part of the University in that it is a part-time, year-long program offering no academic credit for a selected number of participants. There is some question as to how it can be handled administratively after NSF funding. At present, it is officially considered part of the continuing education program of the University. As the evaluators understand it, if the program were to continue as a continuing education offering, it would have to operate as an open enrollment course. It could remain a no-credit program in that case. It could become part of the Graduate School, in which case entrance requirements could be maintained. Academic credit would be received if it were a regular graduate course. In either case, participants would be expected to pay the regular tuition.

The simplest solution would appear to be to integrate potential NSF participants into regular course offerings of the polymer science program. The drawbacks to this approach would be, in all probability however, a loss of the supportive, noncompetitive atmosphere prevalent among the current participants and between the participants and faculty members.

All participants were enthusiastic about the amount of time faculty members were available to them. It appeared that faculty treated the women at least as well--if not more supportively-- as their regular graduate students. As noted previously, lab facilities (including research equipment not normally used by students) were available whenever the participants needed to use them.

The program began with a month of review in undergraduate organic and physical chemistry. By the middle of November 1976, lectures specifically related to polymer science were begun. Topics of the lecture units were "Introduction to the Physical Chemistry of Macromolecules," "Polymerization Mechanisms and Molecular Weight Distributions," "Introduction to NMR Spectroscopy of Macromolecules" and "Introduction to the Organic Chemistry of Macromolecules." Because of their background, some of the participants needed additional tutorial assistance and this was provided all year. Laboratory sessions were geared around 11 groups of experiments. According to the participants, it often happened that lab activities occurred before presentation in lecture of the theory underlying them. Although the theory was covered eventually so that they felt the labs and lectures to be very related, the timing of the two sets of activities should be reviewed to see if a better fit could be achieved.

Other activities which seemed especially useful were career workshops (covering topics such as resume writing, interviewing, etc.) conducted by staff of the Association of Technical Professionals and visits to three nearby industries heavily involved in polymer work. Formal counseling sessions were attempted, but they did not seem particularly valuable. Rather, the project director served in the counseling function on an informal--and apparently very successful--basis all year.

When the proposal for funding was written, it was stated that tests would not be given to the participants. The project director soon realized, however, that they would be necessary for two reasons: (1) the women exhibited undue anxiety over the idea of test taking and the director wanted to get them over that and (2) in order to recommend participants for graduate programs or employment, she felt she needed a more objective measure of their achievement. While the women still did exhibit some anxiety about the tests, it was not thought by the evaluators to be uncommonly high.

The project director began publicizing the project in local newspapers and received so many applications from that source that she did not need to expand publicity even into nearby Boston. Although other forms of publicity were used (TV announcement; brochures sent to libraries, junior colleges, professional associations, women's associations), the newspaper articles were by far the most successful effort.

All applicants were interviewed by the project director after they had submitted preliminary information about their academic background, reasons for interest in the program, etc. Some of the director's first choices declined entrance, so second choices were offered the opportunity to join the program. That, in most cases, is the reason for having women with undergraduate non-chemistry majors in the program. Grades on transcripts of the participants ranged from slightly above average to straight As. With one exception, all the women had science majors.

Eleven women began the program in the Fall. Two of them dropped out in the Winter because of financial problems. Two of the nine remaining participants work fulltime but were able to arrange their schedules so they could attend labs and lectures. When asked whether they preferred, if funds were available, to provide minimal financial support to all participants or full support to a reduced number of participants who could not otherwise participate (or who were experiencing hardship by trying to work as well as participate), the participants agreed they would vote for the latter option.

In terms of management, the project is very well run. Responsibilities are delegated and the schedule has been maintained. The director spends much more than 20% of her time on the project (the amount for which she is reimbursed by NSF) and should the project be refunded, her reimbursement should be for substantially more time (perhaps 50%, even though this past year she probably spent even more than that on the project). She is involved in the project because of her commitment to affirmative action, and this personal commitment is evident in her association with the project and participants. She appears to be serving in a dual role for the participants--professional role model and counselor/friend--and doing both extremely well. Obviously, the quality of the other staff in the polymer science program is a great asset to this project; but in the evaluators' opinion, it is Dr. Blumstein's willingness to give of herself--personally and professionally--which has assured the success of the NSF project at the University of Lowell.

Other staff involved in the project are Drs. Watterson, Clough, A. Blumstein, Pyun, Salamone and Hsu and Ph.D. candidate Bellantoni. The evaluators met with Clough, Salamone, Hsu and Bellantoni. For the most part, they seemed committed to having the women experience success in the program and were quite willing to devote th'r time to see that they did. The participants were especially appreciative of Dr. Hsu and his willingness to keep the laboratory open beyond "official" lab sessions.

The nine continuing participants ranged in age from 1 1/2 years past her bachelor's degree to 30 years past. Six of the nine had undergraduate chemistry majors, one had biology, one zoology and one humanities (but with work experience in a science field). Not counting the one participant who had been out of school for 30 years, the typical participant had been out of school about eight years and they needed more review than had been realized at the beginning of the program. Several of them said they would have profited from a review of study skills as well as a review of chemistry at the beginning of the program.

All nine of the participants seemed enthusiastic about the program although two of them had had a difficult year mastering the content and one of those two thought she might have made a mistake in attempting to go back to school after being away so long. All of them exhibited a fair amount of confidence in their new capability, however--a condition which, according to the project director, was not present at the outset. Attendance at all activities was high (except for the weekly seminar for regular graduate students, which the NSF participants were invited to attend) and everyone seemed to be expending more than enough effort to keep up (although, because of background, some were obviously able to go faster and further than others).

V. Outcome Evaluation

Although the project was not over when the evaluators visited, a few indicators of outcome were observed. The participants feel they have learned quite a bit about polymer science, although most of them do not feel that the program will succeed in preparing them for a specific job in the field. Some of them feel the need to go on in graduate school in order to compete for higher level jobs in the field and it appears that three of the nine will be in graduate school next Fall (two at the University of Lowell and one at the University of Maryland). Most of the others will be looking for employment (preferably part-time, for most of them) in the Lowell-Lawrence area, but specific placement activities had not been undertaken at the time of the site visit. While the faculty member who organized the field trips to local industries viewed them as providing the participants with an enhanced chance of securing employment at those industries, the participants were not as confident of their usefulness in that particular area.

All viewed the program's schedule as a good one. Those women who had been at home full time but who wanted to return to work liked the gradual transition offered by a two days per week program. Those women who worked appreciated the flexibility afforded by keeping the lab open after lectures so they could perform experiments then. All in all, the schedule seemed to fit everyone's needs.

Not enough of the faculty were interviewed to really determine their reaction to the program. The evaluators' impressions were, though, that the greatest impact will be to show the faculty that there is a large market for a program such as this one and that women who have been out of school for a while can keep up and achieve success in polymer science. Perhaps that will encourage them to recruit more women into their regular graduate program.

VI. Summary Reactions

Overall, the evaluators were very impressed with the Career Facilitation Project at the University of Lowell. Negative aspects of the program were extremely minor in relation to the total program, and have been mentioned in the body of this report. It is unlikely that the project could have succeeded without the commitment of its concept exhibited by the project director. Her role as mediator between the participants and the faculty/university structure was extremely important. The supportive environment--both between her and the participants and among the participants themselves--was the thing viewed by participants and evaluators alike as vital to the project's success. This support was encouraged by a number of things: always being together for labs and lectures, having a physical space where they could work and relax together, not competing for grades. It takes a particular (and for the most part undefined) mix of environment and personalities to achieve a supportive climate like the one found in this program, but it is something worth working for in all such projects.

VII. Recommendations

A few recommendations for program improvement have been noted throughout the body of this report. They are restated here, along with two new ones, for the purpose of clarification.

1. Review the schedule of lab activities and lecture topics to make sure they are as coordinated as possible. When it is impossible to cover theory underlying lab activities before the lab experience, perhaps the lab instructor could provide a more formal introduction than he did this year.

2. In addition to a review of undergraduate organic and physical chemistry, provide reviews of study skills, general chemistry and math to the participants who feel they need it. This extra review could perhaps be offered in the summer before official beginning of the program.

3. If at all possible, have the project adhere to the regular university calendar (i.e., begin in September and end in August).

4. Plans for the placement of participants who want employment after completion of the program should begin early in the project year and may require more coordinated effort than is evident in the reliance on personal contacts with employers in the area (though this should, of course, be continued).

Several recommendations can be made to NSF based on the experience of visiting the University of Lowell program.

1. Provide the option of paying tuition for those participants who want to apply their NSF project experience to a graduate program.

2. Consider refunding those projects which appear to be particularly successful in accomplishing their and NSF's objectives.

University of Notre Dame

I. General Information

Site: University of Notre Dame, Notre Dame, Indiana
Project Director: Dr. Lloyd H. Ketchum, Jr.
Focus: Environmental Health Engineering
Budget: $79,923
Expected Number of Participants: 48
Date of Visit: June 23-24, 1977
Evaluators: Evelyn Brzezinski, M. Joan Callanan

II. Project Overview

The NSF Career Facilitation project at the University of Notre Dame is aimed at women holding bachelor's or master's degrees in biology, chemistry, computer science, engineering, mathematics and related areas of science. It is designed to update their training to a level expected of current graduates in their degree fields and to assist in development of skills necessary for each woman to enter and successfully complete a graduate program in environmental health engineering and science. Women completing the training are expected to enter directly into graduate programs or employment.

The plan was to have four, 12-week, consecutive sessions for four different groups of 12 participants. Thus, during the period of January 1977 through April 1978, a total of 48 women would participate in the program. Content of the program is provided in a variety of modes: formal lectures by members of the environmental health engineering faculty, seminars, tutoring by graduate assistants, mini-courses, audit of formal courses, research participation and independent study. The lectures and research are heavily water and wastewater related, however, according to the project director, the same techniques and skills are needed in programs primarily concerned with air pollution control or solid waste management. The mini-courses are more general, with computer programming, differential equations and statistics being some of the ones offered during the first two training sessions.

The University of Notre Dame is a primarily residential Catholic university located just north of South Bend, Indiana. It was founded in 1842 and, while the Graduate School has always been open to women, the undergraduate program was only opened to female students in the 1972-73 academic year. In 1976-77, undergraduate enrollment was approximately 6700 and graduate enrollment approximately 1800. The College of Engineering, in which the NSF program is housed, has had an enrollment averaging around 1200 in the past several years.

Bachelor of science, master of science and doctor of philosophy degrees are offered in aerospace engineering, architecture, chemical engineering, civil engineering, electrical engineering, engineering science, mechanical engineering and metallurgical engineering. Additional degrees conferred are the master of science in environic design (offered by the Department of Architecture) and the master of science in environmental health engineering)offered by the Department of Civil Engineering).

The NSF program is a part of the environmental health engineering unit of the Department of Civil Engineering. Civil Engineering has eleven faculty members, of whom four are involved in environmental health engineering. The Department has had considerable experience in specialized training programs, having participated in NSF's Undergraduate Research and Student Science Training Programs, American Society of Civil Engineering's Introduction to Civil Engineering for Minority Students and the College of Engineering's Introduction to Engineering (for high school women).

III. On-Site Procedures

The evaluators spent from approximately noon on June 23 until 2:00 on June 24 visiting the University of Notre Dame program. On the first day of the visit, interviews were conducted with the project director, Dean of the College of Engineering, Assistant Dean of Research and Sponsored Programs in the College of Engineering, another faculty member of the environmental health engineering program, an NSF participant from the first training session and six of the seven participants in the current session. Files related to the project and participants were also reviewed. In addition, one of the evaluators sat in on a faculty lecture being presented to the participants. On the second day, the following persons were interviewed: a third member of the environmental health engineering faculty, the three graduate assistants assigned to the NSF program, Chairman of the Department of Civil Engineering, Director of the University's Placement Office and all of the current participants in the program. Finally, laboratory facilities of the Department of Civil Engineering were toured.

IV. Process Evaluation

Institutionalization of a project such as the Career Facilitation Program seems unlikely at the University of Notre Dame. Continuing education is not a primary mission of the university, and the existence of a multi-week, non-credit program during the academic year is unique on campus. There is little indication currently that the program will continue after NSF funding

In the first two sessions, the women arrived at Notre Dame expecting one type of educational content and ended up receiving another. This is perhaps because of a typographical error in newspaper publicity announcing the project as providing training in environ-

mental health, science and engineering. The comma after the word "health" is significant, and seems to account for the higher than expected number of participants with a biology background. In the flyer announcing the program which is sent to women expressing interest, one sentence at the bottom of the first page says "The topics (of the lectures) will be water and wastewater related, as will the entire project" but apparently many of the participants fail to note it. Most participants admit they find the content interesting -- just different from what they had expected.

The faculty lectures are viewed positively, but some of the other educational components have not lived up to expectations. The cooperative research participation between NSF participants and graduate assistants did not occur as planned in the first session, and although plans for it were underway in the second session, it had not begun when the site visit was made (about three weeks into the session). Participants in both sessions audited regular course offerings and this was viewed with mixed feelings by the faculty during the first session. On the one hand, they thought the content the participants were receiving added to their overall knowledge and so the auditing was a good thing. On the other hand, they thought the women spent so much time on the courses they were auditing that they didn't have enough time for other project activities. An attempt to resolve the conflict was made by limiting to one the number of courses which second session participants could audit. The mini-courses received mixed reviews. Some believed they began at too advanced a level. Another suggestion was that one mini-course be run consecutively before beginning another one instead of having two or three running concurrently. A third complaint was that books and other materials related to the mini-courses were not available for purchase, only for loan. This, of course, limited their long-term usefulness to the participants. Finally, as far as could be determined by the evaluators, the weekly seminars which had been planned were not occurring.

The project had much less success in attracting participants than had been expected. In essence, all who applied and met the minimum criterion of educational background were accepted into the program. Numbers at both the first and second sessions were below what had been planned (five and seven, respectively, rather than twelve at each session). The commitment to the overall project goal (of preparing women for entrance into graduate environmental health engineering programs) is less than might be hoped on the part of some of the participants. Of the five first-session participants, one woman did enter graduate school (at Notre Dame), two were employed or in the process of being employed, and the professional direction of the other two was unknown (although the first session participant to whom we talked believed that at least one of the two had decided that environmental health engineering was not the field in which she wanted to continue).

Publicity centered around advertisements in major metropolitan newspapers, news releases sent to women's organizations, alumni associations and other schools offering graduate programs in environmental engineering. Except for the newspapers, the publicity was ineffective. With only a few exceptions, other universities failed to publicize the Notre Dame program. A list of potential employers for session participants was developed for placement purposes and the project director said those organizations were also contacted about potential participants. That, apparently, was ineffective as well, since all of the second session participants had read of the program in a newspaper.

In the proposal submitted to NSF, it was noted that evaluation procedures including pre- and post-participation measures would be developed with the assistance of the University's Social Science Training and Research Laboratory. As far as the evaluators could determine, that was not done. There is no formal evaluation procedure developed to determine what the participants have learned. Process evaluation for the program itself is mainly an informal procedure based on discussions among, variously, the participants themselves, participants and faculty, and participants and one of the graduate students. During the last week of the first session, the women provided feedback to the project director concerning their reactions to the program, suggestions for improving it, etc.

One of the suggestions they offered was that counseling be available. As a response to that, a representative from Purdue University's College of Engineering visited the second session twice to provide career counseling to the participants. She administered two occupational preference instruments during the first meeting and then interpreted results during the second meeting. Reactions to the counseling were mixed. It served a few of the participants' needs but was repetitive for others. The evaluators' opinion was that overall it was viewed as neither a great help nor an unwelcome burden.

The placement component seems a high point of the Notre Dame program. The University's Placement Office has offered the full complement of its services to the participants, even though they are short-term, non-tuition paying members of the academic community. The placement director has met with the participants on several occasions to discuss resume writing, interviewing skills, etc. The participants were very grateful for his help and indicated they would like even more assistance in this area. The first session women participated in several interviews while interviewers were making their regular campus visits, and a job for one of the participants resulted from this. All in all, the placement services and support to the project seem excellent.

The project director has seemed so concerned with recruiting participants for future sessions that management of current sessions has faltered. To add to the problem, he is directing the summer program for high school students at the same time as one of the Career

Facilitation sessions is running. Recognizing the problem, he has asked one of the other faculty members to take over much of the day-to-day operation of the Career Facilitation session. That faculty member seems open to the concerns of the participants and, it is hoped, will be able to provide a closer tie between faculty and participants than has been evident in the past.

The three graduate assistants perform different roles for the participants. Two of them have rather formal relationships with the participants, although they do seem genuinely concerned about the quality of the experience the participants are getting and appear willing to respond to requests for more assistance. The third graduate student has become the counselor and mediator between participants and faculty in addition to her formal teacher/tutor role. She has also been called upon by the project director to assist in recruiting future participants. The proposal states that each of the three graduate students will devote 20 hours per week to project activities, but it appears that two of the students spend somewhat less time than this and the third one spends substantially more.

The schedule of faculty lectures has been followed as planned. Content of the mini-courses has become more flexible to better fit the needs of participants at each session. As noted before, research participation did not occur during the first session and had not begun in the second session at the time of the site visit (although plans for it were underway).

The staff of the project at Notre Dame seem much more formal with and distant from the participants than do the staff at the other Career Facilitation project visited by the first evaluator. With the exception of one graduate student, there did not appear to be any personal tie between participants and staff. There could be several reasons for this impression: the participants had only been at Notre Dame for three weeks; a relatively short term experience such as this may mitigate against forming close ties; it may result from the personalities of all persons involved in the project; it may simply be the style of that department at the University. Whatever the reason, it struck the evaluators that the participants felt very much alone (as a group -- rapport within the group was good) and unsure of themselves and the program; and would profit from a conscious effort by the staff to develop a good group -- i.e., staff and participants -- spirit.

The participants seemed very interested in learning. The likelihood that many of them would enter immediately into a graduate program in environmental engineering seems slight, but that did not diminish their willingness to expend effort to master the content being offered to them. Whereas the first session participants were all quite recent graduates, the second session participants represented a more diverse group in terms of age. They provided quite a bit of support to each other -- a normal event in any case but especially important here where they are not in a particularly supportive institutional en-

vironment. They are not reticent about offering suggestions for project improvement, and many of the suggestions we as evaluators concur with. They will be noted in the Recommendations section of this report.

V. Outcome Evaluation

Outcomes related to participants are hard to define because the participants with whom the evaluators had most contact had been in the program only three weeks and, with one exception, the participants who had completed the training were no longer on campus. Notwithstanding these complications, some impressions can be shared about the overall impact of the project on the participants.

Reaction to the project would have to be classified as mixed. There is some lingering disappointment in finding that the project is more engineering-related than health-related. They express some confusion over where the course of study is heading -- i.e., what the overall program direction is. They are often overwhelmed at the amount of material they are given to master (this is especially true of those women who have been out of school for some time).

On the other hand, they are complimentary of the quality of the faculty, especially as it is shown during lectures. They recognize the tremendous assets of a university such as Notre Dame and enjoy being a part of the campus community. They welcome introduction to potential employers through the Placement Service.

The success of the project in its effect on participants' clarification of career goals is unknown. The opinion of the evaluators is that participants who have been involved so far are there not so much for goal clarification as for introduction to a new field -- curiosity more than decision making. While that may be an appropriate reason for participating, it is likely to make the project goal of preparing participants for graduate programs in environmental health, engineering and science an unrealistic one.

While the project is undoubtedly having some impact on the participants, the same cannot be said of its effect on the faculty and institution. Obviously, the faculty is affected by having to deliver more lectures, interact with more students, etc. But in terms of any long-term effect, there seems little indication of potential impact.

VI. Summary Reactions

The evaluators were troubled by this project because it seemed to have the potential for providing valuable educational experiences, but the potential wasn't being realized to the extent that it might.

Failure to reach its potential were for reasons both within and outside the realm of the project staff's responsibilities. The failure to attract a sufficient number of applicants to allow selectivity among participants is a major problem. It may be that the project director did all he could to publicize the project and it is simply the fact that Notre Dame is located away from a major metropolitan area that accounts for the small number of applicants. The fact that the program is a short-term intense one may discourage applicants: they may not think the program lasts long enough to warrant moving, yet it may be too long to allow an apartment back home to go vacant, a job to stay unfilled, a family to be left alone; but it is so intense that there is no chance of commuting, as it might be possible to do if the program lasted three days a week (for example), as most of the participants were from the Chicago or Indianapolis metropolitan areas.

Another major problem was in the amount of time the faculty were able or willing to give to the participants. While it was the evaluator's feeling that faculty would respond to participants' requests for time, they did not offer it as a matter of course. The faculty did not seem to take into account the fact that participants in a program such as this may have important differences from a regular graduate student and those differences may require different approaches on their part. With some exceptions, they also did not seem to be offering the support many of the women needed to have a valuable experience. The whole attitude surrounding the project seemed to be "We're offering you the content -- it's up to you to internalize it." That may be appropriate for a self confident student who, because of recent graduation or involvement in a profession, has kept on top of her academic field. However, that type of person is probably already in graduate school. The Career Facilitation project, supposedly, is aimed at another type of student.

VII. Recommendations

Recommendations for project improvement are offered in the areas of recruitment, content and management.

Recruitment

1. In announcements explaining the program, what is meant by environmental health science and engineering should be defined more precisely. It should be pointed out more explicitly than is done now that the content and techniques to be offered do relate to a variety of contexts, but that emphasis is on water and wastewater related topics.

2. More attempts should be made to use the potential employers identified for placement purposes as providers of participants. The need for upgrading the skills of their employees--especially female staff members--should be pointed out, and it should be shown how this can be accomplished via the project. Perhaps arrangements could be worked out so that the NSF grant pays for a participant's training and her employer pays for her living expenses. It could be worked into an overall staff development program that most large companies have anyway. Letters and other contacts with industry would have to be couched in a "how this can help you" approach.

3. Participants should have their own copies of materials related to coursework, especially workbooks and other consumable materials.

4. A staff meeting with the graduate assistants should be held before participants arrive, in which each participant's background (coursework and job experiences) is reviewed thoroughly. Course content should be modified as appropriate. This must be done early enough so that it is feasible to modify content and teaching approaches.

5. If participants are to be allowed to audit just one regular course, they should know that at the time they apply.

6. Additional field trips should be provided in the area so the women can see what an environmental engineer does. Learning should not be restricted to the classroom and laboratory.

7. Consideration should be given to allowing the women to complete one mini-course before beginning another. Especially for the women who have been out of school for some time, it may be better to provide new content in small, discrete steps.

8. The idea of involving Notre Dame counseling staff in the project should be explored so that, should participants desire more counseling, resources will be nearby.

Management

1. A faculty advisor should be assigned to each participant if it is impossible for the project director to handle those responsibilities for all the participants. The advisor should meet with each participant once every week or two. These meetings should allow time for the participant to discuss content, program activities, suggestions for program improvement, etc., as well as a time for the faculty member to provide personal support to the participant.

2. If the one graduate assistant continues to perform the combined teaching/counseling/recruiting roles, her reimbursement should be increased commensurate with the time she is spending on the project compared with the other graduate students.

3. Formal process evaluation procedures should be institutionalized, so that the project director can have a more accurate idea of the program components which are and aren't working. Also, contact should be maintained with participants of past sessions, and their feedback should be gathered on the adequacy of the training some months (6?) after their involvement when, it is hoped, they are making use of things learned during the training session.

Based on the experience of visiting the Career Facilitation project at the University of Notre Dame, the only specific recommendation for NSF is to explore the possibility of providing overall program publicity in media which would be impossible for a single project to use--e.g., popular magazine, Sunday newspaper supplements. It is understood that Career Facilitation Projects are supported through grants, rather than contracts, and therefore that NSF can provide only limited control over the projects. Nonetheless, a more general comment is that NSF should maintain as close a contact with projects as possible, so that problems can be identified early and advice and suggestions offered.

Polytechnic Institute of New York

I. General Information

Site: Polytechnic Institute of New York, Brooklyn, New York
Project Director: Dr. Bernard J. Bulkin
Focus: Polymer Science and Engineering
Budget: $59,424
Expected Number of Participants: 50
Date of Visit: July 21-22, 1977
Evaluators: Esther Lee Burks, Conrad Katzenmeyer

II. Project Overview.

The primary purpose of the project is to prepare women to enter either the Certification in Polymer Science Program, the M.A. Program in Polymer Science and Engineering, or the Ph.D. Program in Polymer Science and Engineering. In addition, the project activities are designed to assess the effectiveness of the remedial program offered, both with respect to participant achievement and participant and faculty satisfaction with the program. The project designers also seek to gain information about factors related to career achievement for women in engineering, and to use experience in this program as input to other programs for retraining chemists.

The project is funded for 21 months, and uses faculty-created short courses, commercial audio-tape workbook courses, regular Polytechnic courses in the areas of chemistry and polymer science, to accomplish its academic goals. In addition, seminars relating to careers in polymer science and job search and placement assistance are provided. Students may participate without charge in course-work related to the goals of the program from March 1977 through fall semester 1977.

Polytechnic Institute of New York is a private institution, which currently enrolls about 4500 students, mostly in engineering disciplines. Science and humanities majors are offered as well. All graduate courses are offered at night; undergraduate courses are offered in the daytime. Polytechnic was begun as an all-male school, and admitted its first women in the 1950's. The percentage of women remained quite low, however, until recently, when a number of steps were taken to emphasize the value of science and engineering careers for women. The majority of its graduate students work during the day, and attend school at night. As noted above, the Dean of the College of Arts and Sciences is the project director. Both the departments of chemistry and chemical engineering are involved in the project, and in the degree programs to which it is aimed.

III. On-Site Procedure.

The site visit schedule comprised a day and a half of interviews with staff and participants, visits to project activities, and inspection of facilities and project records. Interviews were held

with the project director, Dean Bulkin, the project counselor, Dr. Kramer, the Provost of the Institution, Dr. Conti, and two of the faculty involved in teaching of courses in the project. Participants were interviewed in small groups over a period of approximately two hours. A career education seminar regarding discrimination in salaries for women was observed, as well as the conduct of two oral examinations over audio-tape workbook courses. Student files were also reviewed.

The on-site was originally scheduled for July 14-15 but due to the New York City blackout on July 13th, it was necessary to reschedule a week later. This created some problems, as the 21st was the project's last meeting of the term, attendance was less than it would have been a week earlier, and most academic activities had been completed prior to the 21st.

IV. Process Evaluation.

In this section, the discussion is addressed to two primary issues--the integration of the project into current activities at the institution, and the degree to which the project has been carried out according to its proposed plan and objectives.

The first of these--institutional responsiveness--is the factor most relevant to the likelihood for continuation of the project in the absence of NSF funding. The program is, in several aspects, outside regular institutional procedures. Academic credit is at the discretion of the director; students do not go through regular registration procedures and fee payment; and students are not evaluated for academic performance in the same ways other students at Polytechnic are. The academic content of the program is, however, within existing departmental activities, since the integration of chemistry and chemical engineering which is at the heart of the project is not a synthesis created especially for the project. The project objectives seem in no way in conflict with department or institutional objectives. There has not been a concerted effort, however, to provide career guidance to students generally, nor to provide an ongoing women's program, according to the Provost. Thus, the necessity to attract women and to provide career guidance requires a special start-up cost for this grant. In institutions where ongoing women's programs and career guidance activities exist, a program of this type has existing institutional nets to link with, making continuation of such a program somewhat more likely. Staffing of the project seems to have been carried out with the aim of integrating the project, since faculty from both the engineering and chemistry units are involved in teaching.

Facility availability for the program is, in general, good, since the library and the school itself are open at night, when project participants come. No computer use is required in the program. The lack of access to lab facilities has been a problem, since much of the emphasis in the audio-tapes is instrumentation. Students have expressed a need to use some of this instrumentation. An effort is

being made to allow women to take a lab course in the fall. No study area or social headquarters for students was set aside. All classes are held in a single building, which has parking facilities nearby.

The following discussion is directed to the match of proposed activities with those being carried out. Educational and non-educational components of the project are described, as well as management, staffing, and participant characteristics.

The content of the program includes instruction in calculus, chemistry, thermodynamics, chemical engineering principles, and instrumentation. Each student's program has been designed individually, after consideration of her background, and in light of the goals of the project which emphasize a polymer science orientation. Participant records and personal interviews were utilized to determine the level of mathematics and chemistry remediation perceived as necessary by both the students and the Project Director. Students come once or twice a week, depending on the individual program.

A variety of learning methods is available to the students. Faculty-created short lecture-type courses, commercially available audi-tape workbook modules, and standard Polytechnic courses are available to the students free of charge. Progress in the audio tape courses is assessed by means of an oral examination, conducted by the Project Director. Such an experience has been shown by educational research to be an important part of PSI (Personalized System of Instruction) programs and other Keller-type plans. The chance to verbalize and interact with others about content areas is of considerable value. Apparently no other means of evaluation is used for these courses. Evaluation in regular Polytechnic courses is through grades. The short courses are on a pass-fail basis.

Publicity for the project did not generate the desired number of students. Eligibility for the program was defined as a B.S. in chemistry or related field obtained between 1961 and 1975. Recruitment procedures included media coverage through press releases, advertisements in publications such as Catalyst and New Engineer, mailings to major chemical companies in the New York area, and direct mailings to graduates of City University of New York, Brooklyn College, Rutgers, Barnard, and New York University. Project personnel believe that direct mailings to individuals was the most effective of the methods. The brochure used in the mailings did not elaborate upon the nature of the careers open in the polymer processing field to any great degree. This is an emerging field, and women who have been out of the job market for some time may require more information in order to relate their own backgrounds to this field. The result of the recruitment process was a group of 33 acceptable applicants, seven of whom are not U.S. citizens, compared to a goal of 50.

Participant selection procedures were essentially subjective, carried out by the Project Director. So far as can be determined from student records, the group members seem adequate to handle the content of the program; and teaching faculty concur with this judgment. The underemployment criterion described in the proposal was met by the students' own assessment of their need for career facilitation. At the outset of the project, accepted students were given the A. C. S. test for mastery of chemistry. Performances ranged from the lowest percentile to the 66th percentile, a fact which provides evidence that the selection procedure resulted in a group which is in need of the remediation offered.

Evaluation procedures proposed included pre and post program administration of the standardized exam of the American Chemical Society, and administration of various psychological inventories. In addition, biographical data were to be obtained and analyzed, and satisfaction of participants and faculty with the program was to be assessed. The initial A. C. S. testing has taken place, as discussed above. The Bem Sex Role inventory was administered informally to 11 of 30 participants as an adjunct to a seminar talk on discrimination in salaries for women. Program satisfaction is being assessed through informal means. No biographical analysis has yet been obtained, nor have more formal psychological procedures been administered. Post measures for the A. C. S. exam, administration of measures to a control group of current Polytechnic seniors, and comparisons of performance in graduate school for those women who go on to graduate school are planned for later in the program. Tracking of individual student's progress has been a problem, due primarily to the individualization in the program, and to the fact that workbook courses are used at home.

Project management has resulted in a number of outcomes. Assignment of teaching responsibilities has included both engineering and chemistry faculty. Scheduling of short courses has proceeded, in general, smoothly, with only one or two conflicts, according to faculty and students interviewed. The overall program schedule, as outlined in the proposal, has slipped approximately six months, due primarily to the recruiting difficulties experienced. Thus, applicant assessment and testing took place from January through March, rather than in October, as specified in the proposal. Placement of students in graduate programs, and post-testing will take place in December rather than in May. The two seminar programs on career-related topics have also been moved back six months. The slippage in time does not seem to have affected the program offered, however.

Staffing of the project includes the project director, a counseling and evaluation task leader, and teaching faculty. The fact that the director is Dean of Arts and Sciences means that red tape is minimized. The project director's enthusiasm and competence in the subject area of the project, as well as his enthusiastic relationships with students, allow him to maintain close contact

with the project. The counseling and evaluation leader is a faculty member with experience in teaching courses in the psychology of women, and is strongly supportive of its goals. We had no opportunity to interview placement personnel from the institution, nor presenters at the seminar. These latter included two women from academic settings, and two from the oil industry. Two of the proposed faculty participants--Drs. Anita Lewin, and Guiliana Tesora--were unable to participate in the project.

The women in the program are a diverse group, ranging in age from 22 to 40. Slightly more than half of the participants are married. Forty-five percent have children living at home. The majority have obtained a B. S. or B. A. in chemistry. The remainder hold Bachelor's degrees in related fields such as mathematics, biology, physics, or engineering. Fourteen percent of the participants have some graduate education. Twenty of the original 33 received their most recent degree within five years of entering the project. Fifty-four percent were unemployed at the time of application to the program. Job experiences vary widely, and include positions as chemist, teacher, engineer, nurse, and other non-technical employment. The most frequently stated reason for applying to the program was a participant's inability to find a job, or to receive adequate pay in her current job. Thus the program is seen as a new career opportunity by most applicants. About half the 30 students still in the program will take a graduate course while in the program. Most frequently chosen is the course "Introduction to Polymer Materials." Seven of the women in the program are not U. S. citizens, and several others are foreign-born, although now citizens. College grades, for the group, were not, as a rule, high, nor are employment histories impressive.

Thirty of the original 33 are considered active in the program. Eleven were present for the final seminar of the first seminar course. Several of the participants drive considerable distances for the program--one as much as three hours each way, twice a week. Of the six lecture courses offered, all had from four to seven students volunteer to attend, even though they were not required to by their individually-scheduled program. The group present at the closing seminar seem enthusiastic about their experiences in the project, and overall commitment of those we interviewed seems high. One woman had just obtained her first professional job, with the assistance of the project's staff. The following information is not yet available: number of students who have completed all assigned short courses; number of students who have completed all assigned audio-tape courses; number of students who have completed all courses volunteered for; number of students in courses for regular undergraduate or graduate credit; estimate of average number of hours invested by participants in the program.

College of St. Catherine

I. General Information

Site: College of St. Catherine
Project Director: Sr. Mary Thompson
Focus: Chemistry
Budget: $30,350
Expected Number of Participants: 60
Date of Visit: July 18-19, 1977
Evaluators: Charles Bertram, Frances Lawrenz

II. Project Overview

The purpose of the project is to provide women who have previously majored in chemistry or biochemistry with an opportunity to update their knowledge of chemistry and instrumentation skills so that they can return to or enter employment, primarily in an industrial setting. The women first update their knowledge of theoretical chemistry through individualized use of a series of audiotape-slide presentations, and then refine this knowledge in the laboratory through use of technical equipment. Although the work is completed individually, there is ample opportunity for discussion of progress with the chemistry department faculty. Career opportunities may be explored with the placement office as well as the faculty. In addition, participants may enroll in an assertiveness training program and/or participate in seminars designed to inform them about the emerging roles of women in industrial settings. Appendix A is a list of seminar leaders.

According to the 1976-1978 catalog, the College of St. Catherine "attempts to be open to innovative and creative approaches in teaching and in social living. It encourages students to consider a wide choice of educational opportunities and professional options without undue attention to the more narrow expectations society tends to impose on women."

The college has an enrollment of approximately 2,000 women, which represents a 50 percent increase in enrollment during the past five years. About 50 percent of the women are enrolled in education and another 20 percent in nursing. The remainder are in a variety of fields of study, ranging from chemistry to East Asian studies. About ten percent of the enrollment is made up of older women taking courses through the Continuing Education Program. These women take regular college courses, including assertiveness training if they wish, and appear to fit in well on the campus in a social sense.

Five persons serve on the chemistry department faculty, although only two were present at the time of the site visit. Ten courses are required for a major in chemistry, including advanced analytical chemistry, two supporting courses in physics, and calculus I and II. The college offers a Bachelor of Arts in chemistry, based on acceptable completion of 128 semester hours and three interim courses.

III. On-Site Procedure

The information on which the evaluation is based was obtained through interviews with selected individuals, inspection of participant files, observation of instruments, equipment, and classrooms, and a study of certain background materials such as college catalogs and the NSF proposal. The site review began at approximately 2:00 p.m. Monday with an interview with Sister Thompson, followed by an orientation to the audiovisual equipment and various instruments in the analytical laboratory. The president of St. Catherine's was interviewed for approximately one hour, beginning at 8:00 a.m. Tuesday. That interview was terminated so that the evaluators could sit in on an assertiveness training session conducted by Ms. Louise Osojnicki Hiniker from the counseling office. After about 40 minutes, the evaluators returned to the chemistry building for an interview of some 30 minutes with one of the program participants. The final discussion at St. Catherine's lasted until about 12:00 noon and was with Sister Thompson and Sister Marquita Barnard, one of the chemistry faculty members. The evaluators exchanged impressions and discussed the expected evaluation report during the return flight.

IV. Process Evaluation

Generally, the institution has been quite responsive to the Women in Science Career Facilitation Project. The project was executed efficiently and, with two exceptions, ran as planned. As indicated later in this report, the exceptions were that the number of participants was fewer than expected and the project was started later than expected.

The project fits well into the academic program of the chemistry department, as well as the total college setting. The chemistry laboratory is easily available at almost any time to project participants. The audiovisual equipment is quite accessible and may be taken home as desired, and there is a small library of chemistry textbooks and other literature available in a group meeting area.

The staff of the chemistry department is apparently quite willing to assist the program participants with any activity designed to help them reach career goals. As more program participants are recruited, each faculty person will advise two returning women. The services of the Continuing Education Program are also available to them.

The objectives of the Women in Science Career Facilitation Program are quite congruent with the institutional objectives. In fact, the project might well be envisioned as one extension of the institutional mission. The general thrust of the College of St. Catherine is to demonstrate "basic respect for the intellectual, social, and creative potential of women" and the Women in Science Project is only one exemplary activity designed toward that end.

The project is designed to provide a general updating in chemistry and has a strong emphasis on the use of instruments. The content includes slide-tape programs produced by Communication Skills Corporation of Fairfield, Connecticut, which are used in Caramates. A Caramate is a portable unit about the size of the body of an overhead projector which uses carousel slide trays and cassette audio-tapes. The tapes are keyed so that the slide tray can be advanced when the visual and audio material has been sufficiently studied. Students also complete written exercises and quizzes to reinforce learning and provide a measure of relative progress. A substantial number of Caramate programs are available to the participants, and the students may select from these according to their needs and interests as agreed upon with their advisor. The project participants usually begin with Caramate slide-tapes which describe basic principles of chemistry and then move on to programs which describe proper use of instruments.

The instructional delivery system is essentially an individualized approach. Each student progresses at her own rate through the Caramate programs until her review of chemical theory is complete. Then she is given individual problems in the chemistry laboratory. These problem exercises have been previously tested with advanced chemistry students at the college and are felt to be quite appropriate for the project students. Caramate tape programs are used to familiarize the students with the instrument before actual experimentation begins. Conducting experiments with analytical instruments reinforces and focuses the student's knowledge of the theory behind the particular instrumentation while providing practical hands on experience. This experience is necessary since it can be transferred to the other perhaps more sophisticated equipment usually found in industrial settings.

Observation of the Caramate programs by the evaluators, as well as discussion with faculty, indicated that they are quite accurate, well designed, and very useful to the participants. The participant who was interviewed felt that the Caramate programs are quite useful as a review of chemical concepts but she did not recommend using the programs for initial teaching in chemistry.

The most apparent weaknesses of the project concerned the advance publicity for it and a related late start-up date. Sister Thompson returned from a camping trip in Europe to find that the project had been funded. Therefore, the equipment wasn't ordered until November. There was no publicity until January when the equipment became available, since she didn't want applicants until the program was in place. Announcements were sent to area newspapers, but since there were no inquiries from the Minneapolis area, some of them apparently failed to carry the ad. As a result, only three and possibly four persons enrolled for the project, rather than the expected ten, and they began work during the late spring and early summer, rather than the previous February as anticipated.

All the participants are required to be chemistry or biochemistry majors and to have received their degree from two to fifteen years ago. One possibility for the future is that the population be enlarged to include persons other than chemistry majors, such as biology majors who need a strong background in chemistry before attempting employment.

Evaluation procedures are essentially informal, although progress through the Caramate programs is based on successful completion of quizzes at the end of each program. In addition, the frequency of use for the Caramate programs is monitored through a checkout system operated by Sister Thompson. The proposed forms that permit faculty members and project participants to assess participant growth are not currently being used but may be developed and put to use if additional participants are recruited for the fall term. Of course, another type of evaluation is the informal discussions among project students and faculty, and among faculty and college administration. The people at St. Catherine's will apparently determine if the project is meeting their instructional goals and incorporate it as an ongoing procedure if they feel that it does.

Another aspect of the project is the career placement service given by various groups and individuals. Sister Thompson and other faculty are quite well acquainted with chemists in the neighboring industries, primarily through American Chemical Society meetings. She can advise them concerning job opportunities and contacts with an industry. The program participant who was interviewed felt that the college's placement service is an additional benefit of the project, since she can put her credentials on file there and have a set available within the state of Minnesota.

The participants may also attend the assertiveness training sessions which are designed to help women learn to express themselves more effectively within a social context. These are group training sessions operated out of the counseling office for regular students, as well as for those in Continuing Education or associated programs who desire the training.

The project appears to be managed quite well. Once the project was started, a schedule was adhered to, with the exception of the publicity and late start problems. Those students available were given services, and adequate records were maintained. The equipment was maintained properly and the project director was quite capable of leading the staff and students in any intellectual or academic pursuits. The style of management is collegial as opposed to directive, and a sense of common mission guides their various activities.

There will be five staff members serving in the chemistry department as of September 1977. The chairperson of the department is Sister Mary Thompson who is a graduate in physical inorganic chemistry, with a Ph.D. from the University of California, Berkeley, under Professor Robert Connick. Her doctoral dissertation was published as a Lawrence Radiation Laboratory report and has been widely

quoted in the literature of the field. She is a quite competent professional chemist and the college administration is quite accessible to her.

Dr. Patricia Fish was not available for interview since she is on sabbatical until the fall of 1977. Dr. Fish is a graduate of the University of Florida in analytical chemistry and has been involved in science and science education over a 25-year period. As indicated in the project proposal, she completed her college education, her master's degree, and doctorate while married and bearing five children and while her husband was completing first medical school and then internship and residency. A brief discussion was held with Sister Marquita Barnard who has an MS degree from Notre Dame University. She is a person who has left a field of practicing scientists to teach a few years in the high school setting and has now returned to college ranks. Mrs. Mary McLaughlin was away in Boston with her family at the time of the interview, but has an MS degree in biochemistry from Boston University. She joined the department two years ago, is a mother of six children, and has worked in educational and industrial positions wherever situations permitted. Dr. William D. Gleason is a newly employed faculty member at the College of St. Catherine. He has taught at Carleton College and has a Ph.D. in organic chemistry from the University of Minnesota, and an MS in biochemistry from the University of Iowa. He is 31 years of age and is expected to bring many innovative ideas to the chemistry department. These five staff persons will assist with the Women in Science Career Facilitation Project as is warranted by the increasing number of participants.

Other staff associated with the project includes various presenters in scheduled seminars and the director of the assertiveness training program. Sister Thompson has scheduled various people representing industry to give seminars at various times during the year, and the program participants will have an opportunity to participate in those discussions.

At present, there are only three participants in the project. A fourth person came once but never returned. The first participant has six children, the youngest of which is eight years old. She is taking courses through a local industry (3M) and has a previous level of training comparable to a master of science academic degree. A second participant graduated in 1970 from the University of Minnesota and from high school in 1940. She has an MA in physical chemistry and an additional MA in food science. She wants to get into biochemistry. Her husband is a dentist and she has seven children, two of whom are at home. The third participant, the one who was interviewed, graduated from college in 1961 and has completed courses at UCLA. She is a Phi Beta Kappa, has studied math, and is a liberal arts graduate in chemistry. She is presently substitute teaching in high school and is active in the League of Women Voters. Her husband is a 3M chemist.

A review of the files indicated that the participants have a few characteristics in common. They all are white, good students, and have several children. Their grades are A's, B's, and a few C's, and they are interested in employment outside the home.

The participant who was interviewed indicated that she studies the Caramates on a self determined schedule; she sets aside a period of time each day to study the Caramates in her home. She is generally quite well pleased with the materials. She would like to know whether there is employment opportunity before any further specialization in some field of chemistry is begun. She has previously attended three or four NSF summer institutes and was made aware of the project through her husband who saw an article in the Chemical and Engineering News publication. She doesn't think college credit would be that valuable for her and suggested that if the goal were to get women into industrial chemistry, the program might well be affiliated with some graduate school. However, she feels that the doctorate in chemistry is required for really meaningful involvement in the industrial setting.

V. Outcome Evaluation

The evaluators feel that the project is having a quite positive effect on those participants who have been recruited into it. However, the program at St. Catherine's is not so much designed to clarify career goals as it is to point out opportunities which may exist for immediate employment and provide a means of upgrading skills so that employment can be obtained.

The statement of the woman who was interviewed is apparently typical of the project outcome. She says the project "has pulled it all together for me," and that she would like to teach in high school or junior college. She likes the flexibility of the program and feels that it permits her to work her way back into a graduate routine. She feels she would not have reviewed the material on her own. Her practical outlook is that industry is not now doing much hiring in the area, so there is no use picking up additional academic or skill training which will have little obvious payoff, although she feels that persons who complete the Career Facilitation Project at the College of St. Catherine will be better able to cope with industrial employment than recent college graduates because they should have more experience and maturity. In general, the participant is well pleased with the project, feels that it is helping her achieve career goals, and is well worth her effort.

In summary, the reaction of the one interviewed was quite supportive of the project, although she apparently already decided on career goals prior to entry. Of course, as she attends seminars and finds other possible forms of employment, she may become interested in some aspect of industrial chemistry.

The Caramate programs appear to be an excellent way of transmitting knowledge concerning chemistry and chemical instrumentation. The gain in knowledge as indicated by the quizzes associated with the program should be considerable if the students learn to discipline themselves and follow the advice of the college faculty.

As with many career orientation programs, the project seems to have an interesting effect on the faculty. They are beginning to prepare their own Caramate programs, by preparing audiotapes and slides describing their own special areas of expertise which can be efficiently programmed for student use. Although a program of this type might usually be expected to contribute to consciousness raising, this faculty will probably not have an increase in sensitivity to issues and conditions specific to women.

The project will impact on the institution by providing another means whereby its general goals can be attained. The college president feels that the institution will benefit primarily in four different ways. The college should get favorable publicity for the program, and the program should attract attention of faculty to individualized, programmable techniques of instruction. She feels that the project will provide inservice training for the faculty and that a few successful completions by participants in the project will have considerable influence on all college graduates. She further feels that women who come to the seminars to talk about career opportunities will be of help to all students at the college, and that they may put those discussions and lectures on tape for larger distribution.

If the project is successful in attracting additional participants, there will be some impact on neighboring industries and community groups. With favorable publicity, the community will generally become sensitized to women's potential roles in industrial settings, and industries which are seeking qualified women will have that employment need met.

The evaluators feel that the project has excellent chances for continuation. In fact, Sister Thompson indicated that, if successful, the project would continue without any additional request for NSF funding. The only local expenditures required to continue the project would be for a few chemicals and for some faculty time, the latter of which seems to be given freely for counseling and advisory purposes.

VI. Summary of Reactions

The most positive aspects of the Women in Science Career Facilitation Project operated by the College of St. Catherine are a quite effective use of instructional technology and provision of an environment where women may find roles in society and work acceptable to them. The women should be able to integrate acquired knowledge and skills with an increasing perception of changing expectations and opportunities available to them. The college provides an excellent environment for study and group interaction and many

acceptable role models are available to participants.

The negative aspect of the project are the recruitment procedures and scheduling used to initiate the project. Quite possibly, a reason for a failure of recruitment procedures may be that there are few women who are unemployed or underemployed chemistry graduates living in the Minneapolis-St. Paul area. However, a more deliberate and scheduled publicity campaign should be put in action before the September enrollment.

The evaluators' overall reaction to the project is quite positive. With adequate numbers of participants, the project has considerable potential and might well be replicated in numerous settings--in large industrial settings as well as in colleges and universities.

VII. Recommendations

The recommendations concerning the project deal primarily with the publicity and recruitment issues. Based on discussions, several additional recruitment procedures are suggested. Project staff should attempt to get a full-page feature story in local papers. A human interest story pertaining to one of the participants, replete with photographs of her using sophisticated instruments and indicating her expected role in industry, should be of interest to the readership of area newspapers. Articles should be placed in various school papers such as alumni publications and notices might be placed on library bulletin boards around the community. The use of university extension bulletins was suggested as well as the internal news media associated with local industries.

In general, the college administration and project staff were quite positive concerning the manner in which NSF staff had administered the project. They felt that there was little interference from the NSF staff, that the selection of successful projects was quite fair, and that the college generally benefited from NSF grants.

As for NSF, more consideration should be given to the timing of solicitations and resulting announcements of award. If an award is announced in September, a project may not really get started until mid-term or perhaps the second semester of the award year. Also, NSF should offer more orientation to project directors concerning scheduling, preferably just following the time of project award, and project directors should be encouraged to plan for a start-up time of six months so that equipment can be ordered, supplies put in place, and other initial activities planned. A second suggestion for NSF is that a system of awards to industrial organizations, or a consortia of industrial organizations and institutions of higher education be considered as one means of reaching NSF program goals.

University of Texas, Austin

I. General Information

Site: University of Texas, Austin
Project Directors: N. B. Dale and A. G. Dale
Focus: Computer Science
Budget: $106,609
Expected Number of Participants: 20 - 30
Date of visit: June 23-24, 1977
Evaluators: Conrad Katzenmeyer and Alma Lantz

II. Project Overview

The project "Computing Skills Augmentation for Women in the Natural Sciences" provides an intensive, basic computer skills program that is intended to prepare them for a job as a computer programmer or to continue with graduate work in computer sciences. In addition, the participants take refresher courses in their discipline areas so that they can apply their computer skills to a specific content area that they are already familiar with. The instruction runs for a 12 month period. The refresher and computer course work is done during the spring and fall semester while the summer session is spent on special advanced topics in computing.

The University of Texas at Austin is the main campus for the University of Texas system. It has 32,535 undergraduates and 9,125 graduate students. It is extremely well endowed and has not suffered the serious drops in enrollment that so many other colleges and universities have over the past 10 years. The Department of Computer Sciences is a separate entity, not part of the Mathematics Department as is often the case. It has 35 faculty members, 425 undergraduate majors and 164 graduate students.

III. On-Site Procedure.

We arrived in Austin on the evening of the 22nd. In the morning of the 23rd we attended a lecture that was part of the special seminars being offered in the summer session. Then we talked with the two Project Directors and with the psychologist associated with the project, Dr. Jean Chandy. Following there was a meeting with Dr. James Vick of the Mathematics Department who had had a number of the participants in his classes. After lunch we met with the participants, as a group, for approximately an hour and a half, followed by discussion with the graduate students and support staff attached to the project. Next was a meeting with Dr. Raymond Yeh, Chairman of the Computer Sciences Department. Dinner was with the Project Directors. The next morning we reviewed project files and talked by telephone with a member of the University of Texas staff involved with women's programs on campus.

IV. Process Evaluation.

The University of Texas at Austin is a very large campus, and the mission is traditional undergraduate education, with a strong graduate program. Although there are substantial number of students on campus who do not fit the traditional mold of the 18 - 22 undergraduate or the graduate student directly out of undergraduate study, the campus as a whole remains committed to the traditional mission and has substantial financial support from the state of Texas to do this. On the other hand, the Computer Science Department has a clearly applied mission. It has close connections with industry and with government in the area, and sees part of its role as providing applied degrees. The Career Facilitation Project fits well with the mission of the department, and could easily be tied into the Master's degree program which has been developed by the department. The only problem would be the tuition requirement, which would have to be paid by the participants. Otherwise, the match between the project objectives and the overall departmental direction is excellent.

The project is directed by an Associate Professor and a Lecturer of the department. Alfred Dale is extremely active in a wide range of computer concerns, particularly international computer science. Nell Dale, who performs most of the project director functions, was an instructor in the department but could not be considered for a permanent position because her husband was already part of the faculty. She has extensive experience in industry as well as academic computing. Both have been active in social science and linguistic research. A number of other faculty and graduate students have also played substantial roles in the project.

The facilities available are excellent. The Computer Science Department has its own building with ample classroom and seminar space. There is easy access to the University of Texas computing center.

A number of courses have been prepared for this project. These include "Introduction to Computing" in the first semester, and "Omnibus Course" (covering four areas of computing) and "Programming Techniques" in the second semester. Special topics were presented by a series of guest lecturers during the summer session. These courses have included substantial hands-on computing experience with computer problems regularly assigned. The overall level has been somewhat less than would be expected in the undergraduate Computer Science program, but has been extremely fast paced and rigorous for the time available.

Some of the material during the summer session was more theoretical than the participants thought it should be, but in general seems to be properly focused. The participants have also taken courses in their own various specialties. There has been some resistance

to these courses, as some participants saw this as irrelevant to the computer experiences. However, they have performed well in the outside courses, and the project directors are committed to the idea that participants should have content as well as computing skills to bring to potential positions.

Publicity for the project was handled primarily through direct mailings from alumni and lists, with additional flyers and a local television interview. The project directors decided to limit the participation to those women in the immediate Austin area. A total of 39 completed applications were received and 31 applicants were interviewed by the project director, another computer science staff member, and the psychologist. Each made an independent assessment of the applicant on the basis of the interview plus the undergraduate and graduate record examination information available. Good concensus was reached on the 3 point (yes, no, maybe) scale. A total of 20 applicants were accepted, of which 18 agreed to participate. One participant dropped before the program started, so the initial group was 17. To date, 4 others have dropped from the program, although one of these has chosen to take a position with the Home Economics Department on campus and thus can be considered a successful completion for the project.

Evaluation procedures have been of two varieties. Much of the direct feedback about the progress of the project has been the responsibility of the project director, Nell Dale; she has remained in close contact with the participants, step by step. The number of exercises and problems included in computer courses provides an excellent source of evidence for the progress of the participants. In addition, grades have been earned in both the computer courses and the outside courses taken by participants. The other part of the evaluation has been a set of attitudinal instruments that were administered to the participants at the beginning of the project and will again be administered at the end. These do not bear directly on the actual progress of the project, but are more of a research character about women in science in general. An attempt was made to secure additional external funding from the Hogg Foundation to expand this activity, but that was unsuccessful due to the small number of participants that a project of this nature would encounter.

The instructional sequence of this project began with a seminar, organized by Dr. Chandy, that included considerable information on campus services available and discussion of the problems to be encountered in returning to school and the work force. This also provided the opportunity for the pre-administration of the attitude instruments. Other than this, there has been no emphasis on counseling during the project, beyond the personal contact with the project director. However, the participants voiced no particular interest in additional counseling services, and in general, appear to have little need for these kinds of activities.

Management of the project has been under the direction of Nell Dale, and it has progressed as planned. There was a need to change the summer activities from internal faculty members to external lecturers, but otherwise there has been no substantial change from the plan. All of the activities have moved on schedule although the demands on the participants to keep pace has been substantial and at times overwhelming.

The staff has functioned very well. Dr. Nell Dale has been very close to the participants. They feel free to drop in and discuss problems with her at any time. The other members of the staff, the faculty members as well as the graduate students, are highly committed to the project and have functioned exceedingly well. The level of instruction has been very high, as well as the commitment to the participants. There is an extremely low faculty to participant ratio in this project, and each of the participants has received substantial individual assistance by the project.

The participants are extremely well qualified. Of the 17 who began the project, 12 were accepted as regular graduate students on the basis of their credentials. They have, in general, very good undergraduate grade point averages and high GRE scores. One participant had a GRE total of over 1400. Almost all have strong quantitative backgrounds. They are also relatively young in comparison with some other Career Facilitation Projects - while there is a range in age, most are in the late 20's or early 30's. Most are married, and some have relatively young children. They are extremely committed to the project despite the tremendous time demands that it makes.

IV. Outcome Evaluation

Participants are extremely enthusiastic about the project. They see clear payoff for the effort expended, and believe that they have gained a great deal from it. There was some dissatisfaction with having to spend the time reviewing courses in their content areas, as there seemed to be less payoff in this activity. There was also expressed a concern about the heavy workload that was expected of them. However, for the most part the project is doing what they expected it would do, and believe that the experience is well worth the effort. They have obtained a basic computer knowledge in a very brief period of time and have had the opportunity to explore the general direction that they would hope to take in the computing field in the future.

Faculty have been very impressed by the participants. While there is range in the quality and motivation of the participants, they have generally performed well. Most are seen as strong candidates to do graduate work in computer sciences.

The project has also had impact on the institution as a whole. There have been discussions with the women studies group on campus as a result of the project, and it is expected that there may be more efforts in programming for women returning to school due to the presence of this project at the University of Texas.

Although the participants have not reached the point of looking for positions at this time, there is reason to believe that they will be able to obtain positions in industry in the immediate Austin area due to the connections that the department has with those industries and the number of positions available. Approximately 50% of the participants will be seeking part-time positions, at least at the outset.

VI. Summary of Reactions.

The project has been very successful. Participants are extremely enthusiastic about the experience, and all evidence indicates that they will be able to obtain work positions or enter graduate school at the end of the project. The workload on the participants is very heavy, but there seemed to be little choice but to have it such given the nature of the computing field and the short amount of time available for a project of this nature. The major problem with this project is the heavy cost, in comparison to the small number of participants who are actually included. Much of this may have been due to the considerable amount of effort invested in curriculum development projects, and could be changed by a larger number of participants, and a lesser commitment to curriculum development in future continuation.

The project appears to fit well into the general philosophy and direction of the Computer Science Department and thus has a great possibility of continuing in the future, and has had some spinoff effects on the Austin campus, as well.

VII. Recommendations.

1. For the project the recommendation is that attempts be made to lower the cost of the project per participant, by increasing the number of people who are included in the program, and by cutting down on the cost of the program activities.

2. In concert with the first recommendation, the project should consider the possibility of lowering its standards for admission, to increase the number of potential participants, and to explore whether the experience that the project provides could also be done with women who do not bring the extremely high credentials that this group of participants did.

Washington State University

I. General Information

Site: Washington State University, Pullman, Washington
Project Director: Dr. Calvin Long
Focus: Applied Mathematics
Budget: $57.267
Expected Number of Participants: 12-25
Date of Visit: September 19 and 20, 1977
Evaluators: Conrad Katzenmeyer, Frances Lawrenz

II. Project Overview

The Mathematics Career Reentry for Women Project at Washington State University (WSU) is designed to give women with one or two years of graduate work in mathematics an intensive review of basic mathematics followed by advanced work in applied mathematics and computing. The project is divided into two parts: a late summer, five week course devoted to an intensive review of core mathematics; and an academic year of course work emphasizing applied mathematics. The summer review course is to cover four topics; algebra, advanced calculus, differential equations, and computer programming theory, each taught by a separate instructor. The women spend their mornings taking classes and their afternoons studying and working on problems. The academic year component allows the women to participate in regular course work and a special weekly seminar. The course work, which follows the typical university pattern of core courses and electives, is taken along with other WSU students while the seminar is open only to the women in the program. The seminar run by Dr. Long will be a combination of heuristic problem solving discussions, lectures by visiting mathematicians and counseling/guidance.

WSU is a land-grant institution located at Pullman in southeastern Washington with an enrollment of approximately 16,800 students. Pullman is located in the midst of rolling wheat fields, and, except for the university, is essentially a small farming community with few other sources of employment. WSU is mainly residential with more than 70 percent of the students living on or near campus. The university is divided into eight colleges and a graduate school. The Graduate school has over 650 faculty members and about 2000 students.

The Department of Pure and Applied Mathematics has 30 faculty members and offers bachelor, master and doctoral degrees. Presently there are 63 undergraduate mathematics majors and 42 graduate students. Advanced degrees require specific amounts of core mathematics courses in conjunction with relevant electives. Electives may be chosen from a variety of courses dealing with pure or applied mathematics. The applied mathematics courses are generally the result of an NSF supported Service-Oriented Options (SOO) project.

This project began in the Fall of 1974 and its goal was to develop alternatives to the present mathematics program which would produce mathematical scientists with the background and perspectives needed for productive collaboration with nonmathematicians in dealing with "real life" mathematical problems.

III. On-Site Procedure

The evaluators arrived in Pullman at about 2:30 p.m. September 19 and were met at the airport by Dr. Long. Discussion began immediately and continued until 4 p.m. when the evaluators met with Drs. DeTemple and Kallaher who had taught two of the summer short courses. This interview was followed by a brief tour of the building facilities, e.g., the library and the computer terminals and then the evaluators examined the project files. The evaluators dined with several of the mathematics staff members at Dr. Long's home. Tuesday began with a one and one half hour interview session with four of the eight participants. This was followed by a visit with Dean B. Roger Ray of the College of Sciences and Arts and lunch with all of the project personnel. After lunch Dr. Millham, the short course instructor for the computer science component, took the evaluators on a tour of the computing facilities. A final look at the files, an interview with the four remaining participants, and a final discussion with Dr. Long concluded the site visit.

IV. Process Evaluation

The women in science project at WSU fits into the existing university structures. Presently all but two of the women are enrolled as regular graduate students. With the exception of their weekly seminar, all the women will be taking regularly scheduled classes along with the other students at WSU. The summer short course review was conducted when the rest of the university was not in session. The Career Reentry Project fits philosophically at WSU because the university is interested in providing service to the state and in producing employable students. This project will enable WSU to aid the state by helping to fully utilize women mathematicians. The university has demonstrated its support for the project by providing almost all of the women with at least half time teaching assistantships. Also, each woman has a faculty advisor in addition to the project director and her own office area in the mathematics building which provides easy access to the library and the computer facilities. The project dovetails with the mathematics department's new thrust in applied mathematics (SOO project) because the women will be able to take some of these courses. The SOO project is designed for masters and doctoral students and the women participants will be able to take a number of these courses including the core curriculum requirements. In spite of these complimentary aspects, the outlook for continuation of this project is not good. This is mostly because Pullman offers little in terms of a participant pool or in terms of industrial employment or internship opportunities. Almost anyone desiring to participate in the

project would have to move to Pullman and become a full time student.

The project at WSU is well managed. All of the activities are proceeding on schedule and a clear line of responsibility has been established. The only major problem was recruitment. This difficulty led to some modifications of the proposed project but activities are proceeding on the original time line. The recruitment problem was not caused by any lack of effort by Dr. Long. He has searched extensively to find qualified participants and induce them to joining the project. He ran a comprehensive publicity program which included a TV spot, a brochure sent to all alumni or interested parties, notices in at least five newspapers, articles in several of WSU's publications, and notices in the American Mathematical Society and the American Association for the Advancement of Science publications. When Dr. Long realized that the key to obtaining participants was stipend support, he spent a good deal of time soliciting money for the women from numerous sources, not the least of which was WSU itself. He managed to obtain a $4,000 grant from the Weyerhauser Foundation and teaching assistantships for most of the participants.

Since there was difficulty finding applicants, the final group had more varied and less extensive qualifications than expected. Subsequently, the summer course and the academic year plans were modified. The summer course on real and complex analysis was dropped, other summer courses were simplified somewhat and more provision was made for independent work. Two faculty members, Luther and Lutz, were also removed from the budget because of the limited number of participants The academic year changed from the original plan of women with master's degrees in pure mathematics taking additional work in applied mathematics to women with bachelor degrees taking master degrees with some emphasis on applied mathematics.

Before beginning the summer short course the six participants (two more entered at the beginning of the academic year) completed a questionnaire which provided information on their backgrounds and interests in mathematics. From this information the project staff designed the summer course which consisted of five weeks of morning classes in algebra, calculus, and programming theory with the afternoons free for problem sessions or independent work. The classes were of the traditional lecture type with outside assignments. Women who were already familiar with the course content or felt unable to handle it pursued their studies independently under the guidance of the appropriate instructor.

Participation in the summer course allowed the instructors to become familiar with the academic background and goals of the women. This facilitated the selection of the appropriate academic year courses, since each woman had an instructor as an advisor. Each

woman is presently taking those courses that best fit her skills and future plans. For example, one woman is doing independent computer study rather than taking core courses in mathematics while another is taking some senior year level mathematics courses. The majority of the women, however, are enrolled in the core courses for the masters degree program. It appears that most of the women will complete a masters degree and therefore will be enrolled at WSU for more than one year.

Because there is such a small group of participants, evaluation has been completed effectively on an informal basis. Dr. Long has interviewed all of the participants and will continue to talk with them at the weekly seminars. This informal contact also allows for counseling and advising services although each woman also has her own advisor. In addition to these contacts, Dr. Julie Lutz, an astronomer and the only woman on the mathematics faculty, has talked with the women and has made it clear that she is available and willing to discuss any problems a participant may have. The university's counseling and Office of Women's Programs are also available to the women. There is little evidence of job placement efforts, but since most of the women will be there two years, this would be premature.

The project staff members are qualified, committed and enthusiastic. The project director, Dr. Long, has his Ph.D. from the University of Oregon and is chairman of the Department. He is a "pure" mathematician as are Drs. Kallaher and DeTemple, but he has a strong commitment to applied mathematics and is providing the leadership necessary to encourage the rest of the department to move in this direction. He is anxious for the project to be successful, is accessible to the women, and has managed project activities well. Drs. Kallaher and DeTemple are both competent mathematicians who relate well to the women in addition to being good teachers. Dr. Millham is a computer science specialist and has worked to individualize his instruction and to provide the women with practical experience. Hopefully, the visiting mathematicians selected for the seminar will provide the women with encouragement and good role models.

The participants are highly motivated, self-confident women with specific career goals. They are, in general, well-qualified; all but two were accepted as regular graduate students and the other two were admitted on probation. All but two are single and without children. One woman is recently divorced with a small child while another is married with a child in high school. They all are anxious to learn and willing to work hard. If no course meets their needs, they will study the topics independently. All appear to be independent and there is little evidence of any strong espirit de corps within the group at least to this point in time. All have been previously employed and are using the project to transfer careers. As such, they have definite ideas of what they want, and

consequently they compel project personnel to meet these needs. Perhaps as a consequence of their self-confident, independent natures, there seems to be little need for counseling services.

V. Outcome Evaluation

Because the project has only just begun, it is difficult to assess final outcomes. The women are pleased with the project and staff. They felt that the summer course was academically challenging but somewhat rushed. The women stressed that the instructors were accessible and willing to adapt course work and provide extra help. Participation in the project has facilitated the clarification of career goals and has given several of the women a better understanding of their potential in terms of their capabilities and limitations. The women will experience a substantial increase in their knowledge of pure and applied mathematics which will hopefully contribute to their employment opportunities.

On the other hand, it is problematic whether the participants will actually be employable in an applied mathematics area after completing this project. Several with strong computer skills should have no problem; for the others the relevance of the project is less clear. However, Washington State has had great success in placing masters graduate in applied mathematics, so even though the goals and requirements of the mathematics department remain traditionally academic, this project may well provide the entree to employment for these women.

Furthermore, the presence of the project will probably have some effect on the mathematics faculty and WSU in general. Both will become somewhat more aware of and hopefully more sensitive to the needs of returning students and especially women. In considering how this project best meets the needs of the state, other complimentary needs will become apparent. For example, a potential spin-off from this project may be an increase in the number of off campus course offerings in an attempt to bring the school closer to the people who need it. The women themselves are a unique type of student. Their goals in returning to school are very different than the typical 22 year old mathematics graduate student. They are more demanding but also more motivated and more industrious. Recognition of these differences will help to alter the faculty and institutional outlook, especially since the trend in education is towards these less traditional students.

VI. Summary Reactions

The Mathematics Career Reentry Project at WSU is sound and will provide the women with a strong background in mathematics. The major problem encountered was the small number of applicants which

denied the project the chance to select the type of participant initially envisioned. This necessitated modification of the project which led to less emphasis on applied mathematics, a longer term of study for the women, and an attempt to meet the individual needs of the few participants that precluded operating the project as originally envisioned. On the positive side, most of the women fit well into the graduate program at WSU and are likely to complete their master degrees. The small size of the project allows for a good deal of personal contact and individualization of study. All of the women seem to be getting what they want out of the project.

VII. Recommendations

There are three recommendations we wish to make to the project. First, although the women appear self-assured, like all graduate students and probably more than most, they will need reinforcement and encouragement now and throughout their studies. Hopefully, this will be an outgrowth of the weekly seminar. In addition, this seminar should provide contact with appropriate role models so that the women will become familiar with the demands and rewards in their new careers. Secondly, every effort should be made to facilitate enrollments in the applied mathematics courses. This may pose somewhat of a problem because of the number of courses required in the masters program and the time involved in the teaching assistantships. Finally, the women should be provided with job placement services near the end of their academic pursuits.

There are two changes recommended for the NSF Woman's Career Facilitation Program. First, projects should be held near sources of participants or there must be some assurance that expenses will be provided for the women while they are away from home. It is clear that obtaining qualified participants is more difficult than was originally believed. A location, such as Pullman, is unrealistic. Either a woman must make a major change in her professional and personal life by moving to the project site or she must already be in residence. In the case of WSU, the chances for support were probably considered too risky in light of uncertain job prospects at the completion of the project for those who would have to move to Pullman, while the few already in residence had little motivation to participate because there are no jobs in Pullman if they did complete the project.

Second, projects must be required to be realistic about their expectations regarding experience and capabilities of potential participants. The WSU project was designed for women who already have a Master's degree or extensive graduate work in Mathematics. How many such women are there? And how many of those women would need the Career Facilitation Program, given the fact that they are obviously quite unique? Even if an adequate number of women could have been found for WSU, is the pool large enough to justify a continuing effort, or will the first project group essentially exhaust all those who might realistically participate? To set entrance expectations such as this project did is an advantage to

the department and University, as it requires minimal change on their part. However, in lieu of strong evidence that such participants can be obtained, the project should be expected to be appropriate for a far broader range of potential participants.

Third, the program might benefit from a further clarification of goals: Is it to be a skill updating program or a career transfer program? These two require different types of activities and seem to attract different types of participants. While the program can certainly encompass both, it would aid potential participants if the nature of the particular project was more carefully defined.

Appendix A

Women in Science Career Facilitation Projects
Procedures for Site Visit and Format for Site Visit Report

I. General

A. Site

B. Project Director

C. Date

D. Evaluators

II. Project Overview

A. Brief statement of purpose

B. Describe project (including duration, activities, content, instructional method, etc.)

C. Describe institution (including location, enrollment, type of student body, etc.)

D. Describe relevant department (including size of faculty, number of majors, type of degrees confirmed, etc.)

III. On-Site Procedure

A. Schedule of activities

B. Who was interviewed

C. What was observed

D. Other, e.g., review of files

IV. Process Evaluation

A. Institutional Responsiveness

1. Continuation possibilities

2. Incorporation into existing institution/department procedures

3. Match of project objectives with department/institution objectives

4. Staffing

5. Facility availability (library, laboratory, computer, etc.)

** Possible Approaches to obtain information

a. Interview project director, other staff members, administrative officials or (perhaps) others

b. Observe general operations of project and facility usage

B. Project Execution

1. Educational Component

a. Content

b. Instructional delivery (teaching strategies and scheduling)

2. Non-Educational Compenent

a. Publicity for the project

b. Participant selection procedures

c. Evaluation procedures

d. Participant Counseling and Placement

3. Management

a. Assignment of responsibilities

b. Adherence to schedule

** Possible Approaches to Obtain Information

a. Review of project proposal

b. Interviews with project director, staff, technical advisors, and participants

c. Review of files

d. Observations of project activities and use of facilities (laboratories, study space, etc.)

C. Staff (general description, commitment, enthusiasm, etc.)

1. Project director

2. Project staff (all those who played a continuing, integral part in the project)

3. Other staff, e.g., presenters, placement personnel, counselors.

** Possible approaches to obtain information

a. Observations of project activities and staff

b. Interviews with participants, administrators, project director and staff

D. Participants

1. General description of participants

2. Commitment - attendance, level of effort, self-initiated efforts

3. Enthusiasm

** Possible approaches to obtain information

a. Observations of participants

b. Interviews with participants, project director and staff

V. Outcome Evaluation

A. Participants

1. Reaction to project

2. Clarification of career goals

3. Knowledge gain

4. Career preparation

B. Impact on Faculty

C. Impact on Institution

D. Impact on other institutions, e.g., industry, professional societies, women's groups

** Possible approaches to obtain information

a. Observations of participants

b. Interviews with participants, staff and other (e.g., placement personnel, participating industries)

c. Review of participant outcome data

VI. Summary Reactions

A. What were the positive and negative aspects of the project?

B. What outcomes were observed in addition to those intended by the project?

C. What was your overall reaction to the project?

VII. Recommendations

A. What changes would you recommend for the project visited?

B. What changes would you recommend for the NSF program?